Print selected from Online session Page 1 06/18/2003

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(FILE 'HOME' ENTERED AT 09:24:13 ON 18 JUN 2003)

FILE 'REGISTRY' ENTERED AT 09:24:27 ON 18 JUN 2003

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                E ETHYLENE SULFITE/CN
L1            1 S E3
                E PHENYLETHYLENE CARBONATE/CN
L2            1 S E3
                E 2-METHYLFURAN/CN
L3            1 S E3
                E FURAN/CN
L4            1 S E3
                E THIOPHENE/CN
L5            1 S E3
                E CATECHOL CARBONATE/CN
L6            1 S E5
                E VINYLETHYLENE CARBONATE/CN
L7            1 S E3
                E ETHYLENE CARBONATE/CN
L8            1 S E3
                E BUTYROLACTONE/CN
                E .GAMMA. BUTYROLACTONE/CN
                E .GAMMA.-BUTYROLACTONE/CN
L9            1 S E3
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FILE 'CAPLUS' ENTERED AT 09:32:11 ON 18 JUN 2003

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L10         888 S L9 AND L8
L11          41 S L10 AND (L1 OR L2 OR L3 OR L4 OR L5 OR L6 OR L7)
L12          33 S L11 AND ELECTROLYTE#
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10/05823.1

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YOU HAVE REQUESTED DATA FROM 33 ANSWERS - CONTINUE? Y/(N):y

L12 ANSWER 1 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2003:335472 CAPLUS
DOCUMENT NUMBER: 138:341110
TITLE: Nonaqueous **electrolyte** solution and secondary nonaqueous **electrolyte** battery
INVENTOR(S): Sekino, Masahiro; Sato, Asako; Momma, Jun; Oguchi, Masayuki
PATENT ASSIGNEE(S): Kabushiki Kaisha Toshiba, Japan
SOURCE: PCT Int. Appl., 80 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003036752	A1	20030501	WO 2002-JP11160	20021028
W: CN, KR, US				
RW: DE, FR, GB				

PRIORITY APPLN. INFO.: JP 2001-329950 A 20011026

AB The **electrolyte** soln. has an **electrolyte** dissolved in a nonaq. solvent mixt., where the solvent mixt. comprises ethylene carbonate (EC), propylene carbonate (PC), .gamma.-butyrolactone (GBL), optional vinylene carbonate (VC) and a fifth component excluding EC PC GBL and VC, and satisfying x = 15-50, y = 30-75, 0< z< 30, 0< w.ltoreq. 5, and 0< q.ltoreq. 5 (x, y, z, w and q represent resp. proportions (vol. %) of EC, PC, GBL, VC and the fifth component relative to the total vol. of the solvent mixt.). The battery has an electrode group contg. the above **electrolyte** soln. in a battery case.

IT Battery **electrolytes**
Secondary batteries
(Li salt **electrolyte** solns. contg. mixts. of various nonaq. solvents with controlled vol. % for secondary batteries)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate 872-36-6, Vinylene carbonate **4427-92-3**, Phenyl ethylene carbonate **4427-96-7**, Vinyl ethylene carbonate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 132843-44-8
RL: DEV (Device component use); USES (Uses)
(Li salt **electrolyte** solns. contg. mixts. of various nonaq. solvents with controlled vol. % for secondary batteries)

IT 7782-42-5, Graphite, uses
RL: DEV (Device component use); USES (Uses)
(anode; Li salt **electrolyte** solns. contg. mixts. of various nonaq. solvents with controlled vol. % for secondary batteries)

IT 12190-79-3D, Cobalt lithium oxide (CoLiO2), Li deficient
RL: DEV (Device component use); USES (Uses)
(cathode; Li salt **electrolyte** solns. contg. mixts. of various nonaq. solvents with controlled vol. % for secondary batteries)
REFERENCE COUNT: 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 2 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2003:173992 CAPLUS
DOCUMENT NUMBER: 138:224204
TITLE: Battery
INVENTOR(S): Adachi, Momoe; Fujita, Shigeru; Endo, Takuya; Iwakoshi, Yasunobu; Shibamoto, Goro
PATENT ASSIGNEE(S): Sony Corporation, Japan
SOURCE: PCT Int. Appl., 162 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003019713	A1	20030306	WO 2002-JP8498	20020823

W: CN, JP, KR, US
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR
PRIORITY APPLN. INFO.: JP 2001-254547 A 20010824
AB The battery has a cathode, contg. a Li composite oxide active mass having Li and/or Ni and O, an anode contg. a Li intercalating material and/or Li in its active mass, and an **electrolyte**-impregnated separator in between; where the battery has charging voltage .gtoreq.4.25 V, and a total amt. of Li carbonate and Li sulfate is 1.0 mass % of the cathode active mass. Preferably, the **electrolyte** has the concn. of a proton impurity .ltoreq.20 ppm and water .ltoreq.20 ppm.
IT Secondary batteries
(lithium; secondary lithium batteries contg. **electrolytes**, Li or Li-intercalating anodes and Li composite oxide cathodes with controlled concn. of Li2CO3 and Li2SO4)
IT 7439-93-2, Lithium, uses 7782-42-5, Graphite, uses 12668-36-9
RL: DEV (Device component use); USES (Uses)
(anode; secondary lithium batteries contg. **electrolytes**, Li or Li-intercalating anodes and Li composite oxide cathodes with controlled concn. of Li2CO3 and Li2SO4)
IT 12190-79-3, Cobalt lithium oxide (CoLiO2)
RL: DEV (Device component use); USES (Uses)
(cathode; secondary lithium batteries contg. **electrolytes**, Li or Li-intercalating anodes and Li composite oxide cathodes with controlled concn. of Li2CO3 and Li2SO4)
IT 7791-03-9, Lithium perchlorate 14283-07-9, Lithium tetrafluoroborate

21324-40-3, Lithium hexafluorophosphate 90076-65-6 132843-44-8
RL: DEV (Device component use); USES (Uses)
(**electrolyte**; secondary lithium batteries contg. **electrolytes**, Li or Li-intercalating anodes and Li composite oxide cathodes with controlled concn. of Li2CO3 and Li2SO4)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 872-36-6, Vinylene carbonate **4427-96-7**, Vinyl ethylene carbonate 12031-65-1, Lithium nickel oxide (LiNiO2) 113066-92-5, Cobalt lithium nickel oxide (Co0.9LiNi0.1O2) 118557-79-2, Cobalt iron lithium oxide (Co0.9Fe 0.1LiO2) 128975-24-6, Lithium manganese nickel oxide (LiMn0.5Ni0.5O2) 185746-84-3, Aluminum lithium magnesium nickel oxide (Al0.05LiMg0.05Ni0.9O2) 202916-35-6, Chromium cobalt lithium nickel oxide (Cr0.05Co0.2LiNi0.7502) 287718-97-2, Aluminum lithium manganese nickel oxide (Al0.05LiMn0.05Ni0.9O2) 346417-97-8, Cobalt lithium manganese nickel oxide (Co0.33LiMn0.33Ni0.33O2) 364589-12-8, Aluminum cobalt lithium titanium oxide (Al0.05Co0.9LiTi0.05O2) 475637-37-7, Aluminum cobalt lithium nickel oxide (Al0.05Co0.8LiNi0.15O2) 478814-69-6, Aluminum cobalt lithium magnesium oxide (Al0.05Co0.9LiMg0.05O2) 500867-92-5, Cobalt lithium magnesium manganese oxide (Co0.8LiMg0.05Mn0.15O2) 500867-93-6, Aluminum iron lithium nickel oxide (Al0.15Fe0.05LiNi0.8O2) 500867-94-7, Aluminum cobalt lithium nickel oxide (Al0.2Co0.3LiNi0.5O2) 500867-98-1, Cobalt lithium magnesium nickel oxide (Co0.45LiMg0.05Ni0.5O2) 500867-99-2, Cobalt lithium nickel titanium oxide (Co0.35LiNi0.6Ti0.05O2) 500868-00-8, Cobalt iron lithium nickel oxide (Co0.25Fe0.1LiNi0.65O2) 500868-01-9 500868-02-0 500868-03-1 500868-04-2 500868-05-3 500868-09-7 500868-10-0 500868-11-1 500868-12-2
RL: DEV (Device component use); USES (Uses)
(secondary lithium batteries contg. **electrolytes**, Li or Li-intercalating anodes and Li composite oxide cathodes with controlled concn. of Li2CO3 and Li2SO4)

REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 3 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2003:58416 CAPLUS
DOCUMENT NUMBER: 138:124987
TITLE: Nonaqueous **electrolyte** solution and secondary battery using the solution
INVENTOR(S): Takehara, Masahiro; Fujii, Takashi; Kotato, Minoru; Noda, Daisuke; Kinoshita, Shinichi; Ue, Makoto; Suzuki, Hitoshi
PATENT ASSIGNEE(S): Mitsubishi Chemical Corporation, Japan
SOURCE: PCT Int. Appl., 61 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003007416	A1	20030123	WO 2002-JP6906	20020708

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

EP 1317013	A1	20030604	EP 2002-745873	20020708

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, BG, CZ, EE

JP 2003092137	A2	20030328	JP 2002-200364	20020709

PRIORITY APPLN. INFO.:
JP 2001-208992 A 20010710
JP 2001-214638 A 20010716
WO 2002-JP6906 W 20020708

AB The **electrolyte** soln. has a Li salt dissolved in a lactone based nonaq. solvent mixt., where the soln. contains .ltoreq.1 mmol hydroxy carboxylic acid/kg. The **electrolyte** soln. may also contain a N heterocyclic compd. The battery is a secondary Li battery.

IT Battery **electrolytes**
(nonaq. **electrolyte** solns. with low hydroxy carboxylic acid contents for secondary lithium batteries)

IT 80-73-9, 1,3-Dimethyl-2-imidazolidinone 88-12-0, uses 91-22-5, Quinoline, uses **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 96-54-8, 1-Methylpyrrole 109-06-8, .alpha.-Picoline 110-86-1, Pyridine, uses 289-80-5, Pyridazine 289-96-3, 1,2,3-Triazine 623-53-0, Ethyl methyl carbonate 872-36-6, Vinylene carbonate 872-50-4, 1-Methylpyrrolidone, uses **3741-38-6**, Ethylene sulfite **4427-92-3**, Phenyl ethylene carbonate 14283-07-9, Lithium fluoroborate 19836-78-3 21324-40-3, Lithium hexafluorophosphate 38222-83-2, 2,6-Di-tert-butyl-4-methylpyridine
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** solns. with low hydroxy carboxylic acid contents for secondary lithium batteries)

IT 591-81-1, .gamma.-Hydroxybutyric acid 122525-99-9, Zonyl fso-100
RL: MSC (Miscellaneous)
(nonaq. **electrolyte** solns. with low hydroxy carboxylic acid contents for secondary lithium batteries)

REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 4 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2003:40243 CAPLUS
DOCUMENT NUMBER: 138:76172

TITLE: Nonaqueous secondary battery
INVENTOR(S): Murai, Tetsuya; Mukai, Hiroshi
PATENT ASSIGNEE(S): Japan Storage Battery Co., Ltd., Japan
SOURCE: Eur. Pat. Appl., 18 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1276165	A1	20030115	EP 2002-15551	20020711
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, SK				
JP 2003031259	A2	20030131	JP 2001-211767	20010712
JP 2003151623	A2	20030523	JP 2001-348541	20011114
CN 1398013	A	20030219	CN 2002-140953	20020711
US 2003054259	A1	20030320	US 2002-192688	20020711

PRIORITY APPLN. INFO.: JP 2001-211767 A 20010712
JP 2001-348541 A 20011114
OTHER SOURCE(S): MARPAT 138:76172

AB A nonaq. secondary cell includes the following elements: a pos. electrode capable of absorbing and releasing lithium; a neg. electrode capable of absorbing and releasing lithium; and a nonaq. **electrolyte** including a nonaq. solvent and a lithium salt dissolved therein wherein the **electrolyte** contains a vinyl ethylene carbonate compd. represented by the general formula (I); wherein R1, R2, R3, R4, R5, and R6 represent each independently a hydrogen atom or an alkyl group having from 1 to 4 carbon atoms, and furthermore contains at least a compd. selected from the group consisting of vinylene carbonate, a cyclic sulfonic acid ester or a cyclic sulfuric acid ester, and an acid anhydride.

IT Anhydrides
RL: MOA (Modifier or additive use); USES (Uses)
(cyclic; nonaq. **electrolyte** lithium secondary battery)

IT Sulfonic acids, uses
RL: DEV (Device component use); USES (Uses)
(esters, cyclic; nonaq. **electrolyte** lithium secondary battery)

IT Secondary batteries
(lithium; nonaq. **electrolyte** lithium secondary battery)

IT Battery **electrolytes**
(nonaq. **electrolyte** lithium secondary battery)

IT Carbonaceous materials (technological products)
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT Lactones
RL: MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene

carbonate 105-58-8, Diethyl carbonate 542-52-9, Dibutyl carbonate 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT 85-42-7, Cyclohexanedicarboxylic anhydride 85-43-8, 4-CyclohexEne-1,2-dicarboxylic acid anhydride 108-30-5, Succinic anhydride, uses 108-31-6, Maleic anhydride, uses 108-55-4, Glutaric anhydride 616-02-4, Citraconic anhydride 826-62-0, 5-Norbornene-2,3-dicarboxylic anhydride 872-36-6, Vinylene carbonate 1120-71-4, 1,3-Propanesultone 1131-15-3, Phenylsuccinic anhydride 1633-83-6, 1,4-Butanesultone 2426-02-0, 3,4,5,6-TETRAHYDROPHTHALIC ANHYDRIDE 2959-96-8, 2-Phenylglutaric anhydride 3289-23-4 **4427-96-7**, Vinyl ethylene carbonate 4480-83-5, Diglycolic anhydride 7664-93-9D, Sulfuric acid, ester, cyclic 478784-91-7, Ethylene glycol sulfate
RL: MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 5 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2003:5304 CAPLUS
DOCUMENT NUMBER: 138:26984
TITLE: Lithium battery with a liquid **electrolyte** and a gel-type **electrolyte** and without risk of **electrolyte** leakage
INVENTOR(S): Roh, Kwon-Sun; Ihm, Dong-Joon; Lee, Jon-Ha
PATENT ASSIGNEE(S): S. Korea
SOURCE: U.S. Pat. Appl. Publ., 8 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2003003367	A1	20030102	US 2002-143352	20020509
CN 1395336	A	20030205	CN 2002-140526	20020701

PRIORITY APPLN. INFO.: KR 2001-38809 A 20010630

AB The invention provides a lithium battery having improved performance properties and no risk of **electrolyte** leakage which comprises both a liq. **electrolyte** and a gel-type **electrolyte**. The liq. **electrolyte** comprises an org. solvent and a Li salt and the gel-type **electrolyte** comprises an org. solvent, a Li salt and a polymer.

IT Epoxy resins, uses
RL: DEV (Device component use); USES (Uses)
(acrylic; lithium battery with liq. **electrolyte** and gel-type

electrolyte and without risk of **electrolyte** leakage)
IT Acrylic polymers, uses
RL: DEV (Device component use); USES (Uses)
(epoxy; lithium battery with liq. **electrolyte** and gel-type **electrolyte** and without risk of **electrolyte** leakage)
IT Battery **electrolytes**
Leak
(lithium battery with liq. **electrolyte** and gel-type **electrolyte** and without risk of **electrolyte** leakage)
IT Acrylic polymers, uses
Epoxy resins, uses
Fluoropolymers, uses
Polyoxyalkylenes, uses
RL: DEV (Device component use); USES (Uses)
(lithium battery with liq. **electrolyte** and gel-type **electrolyte** and without risk of **electrolyte** leakage)
IT Secondary batteries
(lithium; lithium battery with liq. **electrolyte** and gel-type **electrolyte** and without risk of **electrolyte** leakage)
IT 67-68-5, Dmso, uses 75-05-8, Acetonitrile, uses **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate 109-99-9, Thf, uses 110-71-4 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 623-96-1, Dipropyl carbonate 872-36-6, Vinylene carbonate 1469-73-4, Propylene sulfite **3741-38-6**, Ethylene sulfite 7791-03-9, Lithium perchlorate 9002-84-0, Ptfe 9003-53-6, Polystyrene 9011-14-7, Pmma 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 24937-79-9, Polyvinylidene fluoride 25014-41-9, Polyacrylonitrile 25085-98-7, 3,4-Epoxycyclohexylmethyl-3',4'-epoxycyclohexanecarboxylate homopolymer 25322-68-3, Peo 33454-82-9, Lithium triflate 73506-93-1, Diethoxyethane 90076-65-6
RL: DEV (Device component use); USES (Uses)
(lithium battery with liq. **electrolyte** and gel-type **electrolyte** and without risk of **electrolyte** leakage)

L12 ANSWER 6 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:946889 CAPLUS
DOCUMENT NUMBER: 138:15289
TITLE: Liquid **electrolyte** composition for lithium secondary battery
INVENTOR(S): Roh, Kwon-Sun; Ihm, Dong-Joon; Lee, Jon-Ha
PATENT ASSIGNEE(S): S. Korea
SOURCE: U.S. Pat. Appl. Publ., 7 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002187404	A1	20021212	US 2002-117100	20020405
CN 1385863	A	20021218	CN 2002-105776	20020417

PRIORITY APPLN. INFO.: KR 2001-26758 A 20010516

AB A liq. **electrolyte** compn. comprising a sulfide of a IV-Group element, an org. solvent and a lithium salt is advantageously used for the prepn. of a lithium battery having improved mean voltage, cycling life and capacity properties.

IT Sulfides, uses
RL: MOA (Modifier or additive use); USES (Uses)
(Group IV element; liq. **electrolyte** compn. for lithium secondary battery)

IT Battery **electrolytes**
(liq. **electrolyte** compn. for lithium secondary battery)

IT Secondary batteries
(lithium; liq. **electrolyte** compn. for lithium secondary battery)

IT 67-68-5, Dmso, uses 75-05-8, Acetonitrile, uses **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate 109-99-9, Thf, uses 110-71-4 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 623-96-1, Dipropyl carbonate 872-36-6, Vinylene carbonate 1469-73-4, Propylene sulfite **3741-38-6**, Ethylene sulfite 7791-03-9, Lithium perchlorate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 33454-82-9, Lithium triflate 73506-93-1, Diethoxyethane 90076-65-6
RL: DEV (Device component use); USES (Uses)
(liq. **electrolyte** compn. for lithium secondary battery)

IT 75-15-0, Carbon disulfide, uses
RL: MOA (Modifier or additive use); USES (Uses)
(liq. **electrolyte** compn. for lithium secondary battery)

L12 ANSWER 7 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:946650 CAPLUS
DOCUMENT NUMBER: 138:15279
TITLE: **Electrolyte** for lithium ion battery
INVENTOR(S): Coowar, Fazlil; Macklin, William James
PATENT ASSIGNEE(S): Accentus PLC, UK
SOURCE: PCT Int. Appl., 19 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002099919	A1	20021212	WO 2002-GB2366	20020521

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN,

CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: GB 2001-13544 A 20010605

AB A lithium ion cell comprising an anode layer and a cathode layer each comprising resp. lithium ion insertion materials, sepd. by a separator, in which the **electrolyte** comprises .gamma.-butyrolactone in the range 10-80% by vol., ethylene carbonate in the range 1-30% by vol., and at least one of either vinyl ethylene carbonate in the range 1-8% by vol. or methoxyethyl Me carbonate in the range 10-80% by vol. Such a cell has good elec. properties, and is comparatively safe if overcharged because the **electrolyte** components have high b.p. and high flash points.

IT Battery **electrolytes**
(**electrolyte** for lithium ion battery)

IT Secondary batteries
(lithium; **electrolyte** for lithium ion battery)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate **4427-96-7**, Vinyl ethylene carbonate 35466-86-5, 2-Methoxyethyl methyl carbonate
RL: DEV (Device component use); USES (Uses)
(**electrolyte** for lithium ion battery)

IT 1609-47-8, Diethyl dicarbonate 4525-33-1, Dimethyl dicarbonate 21240-34-6, 1,2-Diphenyl vinylene carbonate 24424-99-5, Di-tert-butyl dicarbonate 50893-36-2, .alpha.-Chlorodiethyl carbonate 167951-80-6, 3,3,3-Trifluoropropylene carbonate
RL: MOA (Modifier or additive use); USES (Uses)
(**electrolyte** for lithium ion battery)

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 8 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:925555 CAPLUS
DOCUMENT NUMBER: 138:15257
TITLE: Secondary nonaqueous **electrolyte** battery
INVENTOR(S): Kotado, Minoru; Fujii, Takashi; Kinoshita, Shinichi
PATENT ASSIGNEE(S): Mitsubishi Chemical Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002352852	A2	20021206	JP 2001-153396	20010523

PRIORITY APPLN. INFO.: JP 2001-153396 20010523
OTHER SOURCE(S): MARPAT 138:15257

AB The battery has a Li-intercalating anode, a cathode, and an **electrolyte** contg. a Li salt dissolved in a nonaq. solvent mixt.; where the solvent mixt. contains a vinylene carbonate deriv. I (R1-2 = H, C1-4 alkyl) and/or a vinyl ethylene carbonate deriv. II (R3-5 = H, C1-4; R6-8 = H, C1-4 alkyl or C2-7 alkenyl), and an acid anhydride.

IT Battery **electrolytes**
(compn. of Li salt **electrolyte** solns. contg. carbonate compd. mixts. and acid anhydrides for secondary lithium batteries)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-30-5, Succinic anhydride, uses 108-32-7, Propylene carbonate 623-53-0, Ethyl methyl carbonate **4427-96-7**, Vinyl ethylene carbonate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate
RL: DEV (Device component use); USES (Uses)
(compn. of Li salt **electrolyte** solns. contg. carbonate ester mixts. and acid anhydrides for secondary lithium batteries)

L12 ANSWER 9 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:925554 CAPLUS
DOCUMENT NUMBER: 138:15256
TITLE: Secondary nonaqueous **electrolyte** battery
INVENTOR(S): Kotado, Minoru; Fujii, Takashi; Kinoshita, Shinichi
PATENT ASSIGNEE(S): Mitsubishi Chemical Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002352851	A2	20021206	JP 2001-153395	20010523

PRIORITY APPLN. INFO.: JP 2001-153395 20010523
OTHER SOURCE(S): MARPAT 138:15256

AB The battery has a Li-intercalating anode, a cathode, and an **electrolyte** contg. a Li salt dissolved in a nonaq. solvent mixt.; where the solvent mixt. contains a vinylene carbonate deriv., I (R1-2 = H, C1-4 alkyl) and/or a vinyl ethylene carbonate deriv. II (R3-5 = H, C1-4; R6-8 = H, C1-4 alkyl or C2-7 alkenyl), and a Ph group contg. cyclic carbonate deriv. selected from III and IV [Ph1-2 = (alkyl)phenyl; R9-10 = H, C1-4 alkyl, (alkyl)phenyl].

IT Battery **electrolytes**
(compn. of carbonate ester mixts. for lithium salt **electrolytes** in secondary lithium batteries)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene

carbonate 108-32-7, Propylene carbonate 623-53-0, Ethyl methyl carbonate 872-36-6, Vinylene carbonate **4427-92-3**, Phenyl ethylene carbonate **4427-96-7**, Vinyl ethylene carbonate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate
RL: DEV (Device component use); USES (Uses)
(compn. of carbonate ester mixts. for lithium salt **electrolytes** in secondary lithium batteries)

L12 ANSWER 10 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:906788 CAPLUS
DOCUMENT NUMBER: 137:387138
TITLE: Secondary nonaqueous **electrolyte** battery
INVENTOR(S): Kotato, Minoru; Suzuki, Hitoshi; Yamamoto, Takahiro; Yajima, Akira
PATENT ASSIGNEE(S): Mitsubishi Chemical Corporation, Japan; A & T Battery Corporation
SOURCE: PCT Int. Appl., 27 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002095859	A1	20021128	WO 2002-JP4944	20020522
W: AE, AG, AL, AU, BA, BB, BG, BR, BZ, CA, CN, CO, CR, CU, CZ, DM, DZ, EC, EE, GD, GE, HR, HU, ID, IL, IN, IS, KR, LC, LK, LR, LT, LV, MA, MG, MK, MN, MX, NO, NZ, OM, PH, PL, RO, SG, SI, SK, TN, TT, UA, US, UZ, VN, YU, ZA, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
JP 2002343430	A2	20021129	JP 2001-152234	20010522

PRIORITY APPLN. INFO.: JP 2001-152234 A 20010522
OTHER SOURCE(S): MARPAT 137:387138
AB The battery has a nonaq. Li salt **electrolyte** soln. between a cathode and a Li intercalating anode, packaged with a .ltoreq.0.5 .dwnarw.mm thick packaging material, where the nonaq. **electrolyte** solvent contains .gtoreq.50 vol.% .gamma.-butyrolactone, .gtoreq.10 vol.% ethylene carbonate, 0.01-5 wt.% vinylene carbonate deriv. I (R1 and R2 = H or C1-4 alkyl groups), and 0.01-5 wt.% vinylethylene carbonate II (R3-5 = H, C1-4 alkyl, or C2-7 alkenyl groups); with the total amt. of I and II being 0.02-6%.
IT Battery **electrolytes**
(**electrolyte** solvent mixts. contg. derivs. of vinylene carbonate and vinylethylene carbonate for secondary lithium batteries)
IT Packaging materials
(laminated packaging sheets with controlled thickness for secondary

lithium batteries)
IT Polyamides, uses
RL: DEV (Device component use); USES (Uses)
(laminated packaging sheets with controlled thickness for secondary lithium batteries)
IT **96-49-1**, Ethylene carbonate
RL: DEV (Device component use); USES (Uses)
(compns. of nonaq. **electrolyte** solvent mixts. for secondary lithium batteries)
IT **96-48-0**, .gamma.-Butyrolactone 872-36-6, Vinylene carbonate **4427-96-7**, Vinylethylene carbonate 14283-07-9, Lithium fluoroborate
RL: DEV (Device component use); USES (Uses)
(**electrolyte** solvent mixts. contg. derivs. of vinylene carbonate and vinylethylene carbonate for secondary lithium batteries)
IT 7429-90-5, Aluminum, uses 9003-07-0, Polypropylene
RL: DEV (Device component use); USES (Uses)
(laminated packaging sheets with controlled thickness for secondary lithium batteries)
REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 11 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:889425 CAPLUS
DOCUMENT NUMBER: 137:355508
TITLE: Polymer **electrolyte** precursor having improved impedance for a bellcore-type polymer battery
INVENTOR(S): Roh, Kwon-sun; Choi, Jong-hyuk; Ihm, Dong-joon; Lee, Jon-ha
PATENT ASSIGNEE(S): S. Korea
SOURCE: U.S. Pat. Appl. Publ., 8 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002172859	A1	20021121	US 2002-143259	20020509
CN 1385920	A	20021218	CN 2002-120206	20020516

PRIORITY APPLN. INFO.: KR 2001-26757 A 20010516
AB A polymer **electrolyte** precursor comprising a VdF-HFP copolymer, a lithium and a plasticizer is used for the prepn. of a bellcore-type polymer battery having improved impedance, low-temp. characteristics, cycle life and self-discharge properties.
IT Kaolin, uses
RL: MOA (Modifier or additive use); USES (Uses)
(filler; polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)

IT Secondary batteries
(lithium; polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)
IT Battery **electrolytes**
Plasticizers
Polymer **electrolytes**
(polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)
IT Polyesters, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)
IT 7631-86-9, Silica, uses 13463-67-7, Titania, uses
RL: MOA (Modifier or additive use); USES (Uses)
(filler; polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)
IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 4437-85-8, Butylene carbonate
RL: MOA (Modifier or additive use); USES (Uses)
(plasticizer; polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)
IT 67-68-5, Dmso, uses 75-05-8, Acetonitrile, uses 105-58-8, Diethyl carbonate 110-71-4 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 623-96-1, Dipropyl carbonate 872-36-6, Vinylene carbonate 1469-73-4, Propylene sulfite **3741-38-6**, Ethylene sulfite 7439-93-2D, Lithium, salt 7791-03-9, Lithium perchlorate 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 33454-82-9, Lithium triflate 73506-93-1, Diethoxyethane 90076-65-6
RL: DEV (Device component use); USES (Uses)
(polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)
IT 25038-59-9, Polyethylene terephthalate, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)
IT 67-64-1, Acetone, uses 78-93-3, Methyl ethyl ketone, uses 109-99-9, Thf, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(solvent; polymer **electrolyte** precursor having improved impedance for bellcore-type polymer battery)

L12 ANSWER 12 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:848321 CAPLUS
DOCUMENT NUMBER: 137:355411
TITLE: Secondary nonaqueous **electrolyte** battery
INVENTOR(S): Kotado, Minoru; Sato, Shuji; Fujii, Takashi; Suzuki, Hitoshi
PATENT ASSIGNEE(S): Mitsubishi Chemical Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002324580	A2	20021108	JP 2002-38703	20020215

PRIORITY APPLN. INFO.: JP 2001-48065 A 20010223
OTHER SOURCE(S): MARPAT 137:355411

AB The battery is a secondary Li battery using an anode active mass, contg. 80-99% of a carbonaceous core material having d002 0.335-0.338 nm carbonaceous and 1-20% of a carbonaceous material having a larger d002 adhered on the core material, and an **electrolyte** soln. contg. vinylene carbonate deriv. I (R1 and R2 = H or C1-4 alkyl groups) and/or vinylethylene carbonate II (R3-5 = H or C1-4kyl group, R6-8 = H, C1-4 alkyl, or C2-7 alkenyl groups).

IT Battery anodes
(anodes from carbonaceous material contg. core and surface layer of different interplanar spacings for secondary lithium batteries)

IT Carbonaceous materials (technological products)
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(anodes from carbonaceous material contg. core and surface layer of different interplanar spacings for secondary lithium batteries)

IT Battery **electrolytes**
(**electrolyte** solns. contg. vinylene carbonate derivs. and vinylethylene carbonate derivs. for secondary lithium batteries)

IT Secondary batteries
(lithium; secondary lithium batteries with **electrolyte** solns. contg. vinylene carbonate derivs. and vinylethylene carbonate derivs. and carbonaceous anodes)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 623-53-0, Ethyl methyl carbonate 872-36-6, Vinylene carbonate **4427-96-7**, Vinylethylene carbonate 14283-07-9, Lithium fluoroborate 21324-40-3, Lithium hexafluorophosphate
RL: DEV (Device component use); USES (Uses)
(**electrolyte** solns. contg. vinylene carbonate derivs. and vinylethylene carbonate derivs. for secondary lithium batteries)

L12 ANSWER 13 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:833355 CAPLUS
DOCUMENT NUMBER: 137:327466
TITLE: Polymeric gel **electrolyte** for lithium battery
INVENTOR(S): Choi, Young-Min; Kang, Byoung-Hyun; Kim, Jin-Kyoung
PATENT ASSIGNEE(S): S. Korea
SOURCE: U.S. Pat. Appl. Publ., 14 pp.
CODEN: USXXCO

DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002160269	A1	20021031	US 2002-131521	20020425
CN 1382746	A	20021204	CN 2002-2107597	20020318
JP 2003017128	A2	20030117	JP 2002-126912	20020426

PRIORITY APPLN. INFO.: KR 2001-22674 A 20010426
KR 2002-8116 A 20020215

AB A polymeric gel **electrolyte** and a lithium battery employing the same are disclosed. The polymeric gel **electrolyte** includes a first ionic conductive polymer having a wt.-av. mol. wt. of greater than or equal to 5000 and smaller than 100,000, a second ionic conductive polymer having a wt.-av. mol. wt. of 100,000 to 5,000,000, and an electrolytic soln. that includes a lithium salt and an org. solvent. The first ionic conductive polymer preferably is at least one polymer selected from polyethyleneglycol di-Me ether, polyethyleneglycol di-Et ether, polyethyleneglycol dimethacrylate, polyethyleneglycol diacrylate, polypropyleneglycol dimethacrylate, polypropyleneglycol diacrylate, and mixts. and combinations thereof, and the second ionic conductive polymer preferably is at least one polymer selected from polyvinylidene fluoride, polyvinylidene fluoride-hexafluoropropylene copolymer, polyurethane, polyethylene oxide, polyacrylonitrile, polymethylmethacrylate, polyacrylamide, polyacetate, and mixts. and combinations thereof.

IT Secondary batteries
(lithium; polymeric gel **electrolyte** for lithium battery)

IT Battery **electrolytes**
Conducting polymers
(polymeric gel **electrolyte** for lithium battery)

IT Fluoropolymers, uses
Polyesters, uses
Polyoxyalkylenes, uses
Polyurethanes, uses
RL: DEV (Device component use); USES (Uses)
(polymeric gel **electrolyte** for lithium battery)

IT 7440-44-0, Carbon, uses
RL: DEV (Device component use); USES (Uses)
(mesocarbon microbeads; polymeric gel **electrolyte** for lithium battery)

IT 75-05-8, Acetonitrile, uses **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 110-71-4 623-53-0, Ethyl methyl carbonate 623-96-1, Dipropyl carbonate 872-36-6, Vinylene carbonate 1469-73-4, Propylene sulfite **3741-38-6**, Ethylene sulfite 7791-03-9, Lithium perchlorate 9002-84-0, Ptfe 9002-88-4, Polyethylene 9003-05-8, Polyacrylamide 9003-07-0, Polypropylene 9004-34-6, Cellulose, uses 9011-14-7, Pmma 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 12190-79-3,

Cobalt lithium oxide colio2 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 24937-79-9, Pvdf 24991-55-7, Polyethylene glycol dimethyl ether 25014-41-9, Polyacrylonitrile 25038-59-9, Polyethylene terephthalate, uses 25322-68-3, Polyethylene oxide 25721-76-0, Polyethylene glycol dimethacrylate 25852-49-7, Polypropylene glycol dimethacrylate 28158-16-9, 2-Propenoic acid, 1,2-ethanediyl ester, homopolymer 31073-72-0, Acetic acid, homopolymer 33454-82-9, Lithium triflate 52496-08-9, Polypropylene glycol diacrylate 53609-62-4, Polyethylene glycol diethyl ether 73506-93-1, Diethoxyethane 90076-65-6
RL: DEV (Device component use); USES (Uses)
(polymeric gel **electrolyte** for lithium battery)

IT 67-64-1, Acetone, uses 67-68-5, Dmso, uses 68-12-2, Dmf, uses 105-58-8, Diethyl carbonate 109-99-9, Thf, uses 616-38-6, Dimethyl carbonate 872-50-4, n-Methylpyrrolidone, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(solvent; polymeric gel **electrolyte** for lithium battery)

L12 ANSWER 14 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:539996 CAPLUS
DOCUMENT NUMBER: 137:111684
TITLE: Nonaqueous **electrolytes** and lithium secondary battery employing **electrolytes** thereof
INVENTOR(S): Yasukawa, Eiki; Shima, Kunihisa; Kominato, Asao; Ishigaki, Ken-Ichi; Wang, Xianming; Fujii, Takashi; Kotato, Minoru; Shigematsu, Yasuyuki; Fuse, Tooru; Satou, Hideharu
PATENT ASSIGNEE(S): Mitsubishi Chemical Corporation, Japan
SOURCE: PCT Int. Appl., 67 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002056408	A1	20020718	WO 2001-JP11630	20011228
W: AE, AG, AL, AU, BA, BB, BG, BR, BZ, CA, CN, CO, CR, CU, CZ, DM, DZ, EC, EE, GD, GE, HR, HU, ID, IL, IN, IS, KR, LC, LK, LR, LT, LV, MA, MG, MK, MN, MX, NO, NZ, OM, PH, PL, RO, SG, SI, SK, TN, TT, UA, US, UZ, VN, YU, ZA, ZM, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
JP 2002203596	A2	20020719	JP 2001-80	20010104
JP 2002203597	A2	20020719	JP 2001-81	20010104

PRIORITY APPLN. INFO.: JP 2001-80 A 20010104
JP 2001-81 A 20010104

JP 2001-372549	A	20011206
JP 2001-372550	A	20011206
JP 2001-388034	A	20011220
JP 2001-388035	A	20011220

OTHER SOURCE(S): MARPAT 137:111684

AB Nonaq. electrolytic liqs. for lithium secondary batteries which have flame retardancy (self-extinguishing characteristics) or incombustibility (no flash point), have a high cond. and are electrochem. stable. One of the nonaq. electrolytic liqs. comprises a nonaq. solvent comprising as an essential ingredient at least one phosphate (a) selected among chain phosphoric esters (a1) and cyclic phosphoric esters (a2). The nonaq. solvent may further contain a cyclic carboxylic ester (b1) and a cyclic carbonic ester (b2). Another nonaq. electrolytic liq. comprises the nonaq. solvent and incorporated therein at least either a vinylene carbonate compd. (c1) or a vinylethylene carbonate compd. (c2) and one or more compds. selected from the group consisting of cyclic amide compds. (d1), cyclic carbamate compds. (d2), and cyclic hetero-compds. (d3).

IT Phosphates, uses
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(esters, for solvents for **electrolytes**; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT Fireproofing agents
(flame retardation; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT Lactams
RL: MOA (Modifier or additive use); USES (Uses)
(for cond. **electrolyte** solvent; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT Electric conductivity
(high in, in **electrolyte**; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT Secondary batteries
(lithium, nonaq. **electrolyte** for; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT **Electrolytes**
(nonaq., solvents for; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT Electrochemistry
(stability in; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT 872-36-6, Vinylene carbonate **4427-96-7**, Vinylethylene carbonate
RL: MOA (Modifier or additive use); USES (Uses)
(additive, in cond. **electrolyte** solvent; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses 12597-68-1, Stainless steel, uses
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(electrodes; nonaq. **electrolytes** and lithium secondary

battery employing **electrolytes** thereof)

IT 7439-93-2, Lithium, uses
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(secondary batteries; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT 21324-40-3
RL: MOA (Modifier or additive use); PRP (Properties); USES (Uses)
(solute in **electrolyte** soln.; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-58-8, Diethyl carbonate 108-29-2, .gamma.-Valerolactone 502-44-3, .epsilon.-Caprolactone 512-56-1, Trimethyl phosphate 823-31-4 867-17-4, Diethyl methyl phosphate 2196-04-5, Ethylene methyl phosphate 10463-05-5, Dimethyl ethyl phosphate 10463-06-6 59259-32-4, Dimethyl propyl phosphate
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)
(solvent, for **electrolyte**; nonaq. **electrolytes** and lithium secondary battery employing **electrolytes** thereof)

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 15 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:505274 CAPLUS
DOCUMENT NUMBER: 137:81358
TITLE: Ethylene carbonate-.gamma.-butyrolactone-based nonaqueous **electrolytes** for secondary batteries
INVENTOR(S): Sekino, Masahiro; Satoh, Asako; Fujiwara, Masashi; Hasebe, Hiroyuki
PATENT ASSIGNEE(S): Japan
SOURCE: U.S. Pat. Appl. Publ., 25 pp., Cont.-in-part of U. S. Ser. No.961,138.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002086216	A1	20020704	US 2001-26816	20011227
US 2002064712	A1	20020530	US 2001-961138	20010924
JP 2002184462	A2	20020628	JP 2001-338586	20010928

PRIORITY APPLN. INFO.: JP 2000-296074 A 20000928
US 2001-961138 A2 20010924
JP 2001-338586 A 20010928

AB A nonaq. **electrolyte**, preferably in the form of a gel or liq., for a secondary battery consists of 20-50 vol.% ethylene carbonate and 40-80 vol.% .gamma.-butyrolactone, and includes a third solvent selected from ethylene sulfite, phenylethylene carbonate, 2-methylfuran, furan,

thiophene, catechol carbonate, and vinylethylene carbonate. Optionally, the battery **electrolyte** can also contain a lithium salt as a solute, selected from LiClO4, LiPF6, LiBF4, LiAsF6, LiCF3SO3, LiN(CF3SO2)2, and LiN(C2F5SO2)2. Under charge-discharge cycle tests at 45.degree., the capacity retention rate at the 100th charge-discharge cycle is .gtoreq.85% of the discharge capacity in the first charge-discharge cycle.

IT Battery **electrolytes**
(nonaq., for secondary batteries; ethylene carbonate-.gamma.-butyrolactone-based nonaq. **electrolytes** for secondary batteries)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate **110-00-9**, Furan **110-02-1**, Thiophene **534-22-5**, 2-Methylfuran **2171-74-6**, 1,3-Benzodioxol-2-one **3741-38-6**, Ethylene sulfite **4427-92-3**, Phenylethylene carbonate **4427-96-7**, Vinylethylene carbonate
RL: TEM (Technical or engineered material use); USES (Uses)
(**electrolytes** contg.; ethylene carbonate-.gamma.-butyrolactone-based nonaq. **electrolytes** for secondary batteries)

IT 7791-03-9, Lithium perchlorate 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 29935-35-1, Lithium hexafluoroarsenate 33454-82-9, Lithium trifluoromethanesulfonate 90076-65-6, Methanesulfonamide, 1,1,1-trifluoro-N-[(trifluoromethyl)sulfonyl]-, lithium salt 132843-44-8, Ethanesulfonamide, 1,1,2,2,2-pentafluoro-N-[(pentafluoroethyl)sulfonyl]-, lithium salt
RL: TEM (Technical or engineered material use); USES (Uses)
(solute, nonaq. **electrolyte** contg.; ethylene carbonate-.gamma.-butyrolactone-based nonaq. **electrolytes** for secondary batteries)

L12 ANSWER 16 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:504005 CAPLUS
DOCUMENT NUMBER: 137:65739
TITLE: Flame-retardant nonaqueous **electrolyte** solution and secondary lithium battery using it
INVENTOR(S): Yasukawa, Hideki; Ishigaki, Kenichi; Kotado, Minoru; Fujii, Takashi
PATENT ASSIGNEE(S): Mitsubishi Chemical Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002190316	A2	20020705	JP 2000-390188	20001222

PRIORITY APPLN. INFO.: JP 2000-390188 20001222
OTHER SOURCE(S): MARPAT 137:65739
AB The **electrolyte** soln. comprises Li salts dissolved in an nonaq. solvent. The nonaq. solvent contains (a) cyclic carboxylic acid ester, (b) carbonic acid ester, and (c) phosphoric acid ester, and vinylene carbonate I (R1-2 = H, C1-4 alkyl) and/or vinylethylene carbonate II (R3-8 = H, C1-4 alkyl) are added to the solvent. The Li battery using the **electrolyte** soln. is also claimed. The **electrolyte** soln. shows excellent self fire-extinguishing performance and has high elec. cond. and electrochem. stability.
IT Battery **electrolytes**
Fire-resistant materials
(flame-retardant nonaq. **electrolyte** soln. contg. carbonate compd. as additive for Li battery)
IT 872-36-6, Vinylene carbonate **4427-96-7**
RL: DEV (Device component use); MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(flame-retardant nonaq. **electrolyte** soln. contg. carbonate compd. as additive for Li battery)
IT 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(flame-retardant nonaq. **electrolyte** soln. contg. carbonate compd. as additive for Li battery)
IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 104-50-7, .gamma.-Octanolactone 105-58-8, Diethyl carbonate 108-29-2, .gamma.-Valerolactone 108-32-7, Propylene carbonate 502-44-3, .epsilon.-Caprolactone 512-56-1 542-28-9, .delta.-Valerolactone 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 623-96-1, Di-n-propyl carbonate 695-06-7, .gamma.-Caprolactone 823-31-4, Ethyl ethylene phosphate 867-17-4, Diethyl methyl phosphate 3068-88-0, .beta.-Butyrolactone 4437-85-8, Butylene carbonate 6482-34-4, Diisopropyl carbonate 10463-05-5, Dimethyl ethyl phosphate 10463-06-6, Butyl dimethyl phosphate 35363-39-4, Ethyl isopropyl carbonate 35363-40-7 51729-83-0, Methyl isopropyl carbonate 56525-42-9 59259-32-4, Dimethyl propyl phosphate 119812-13-4
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(nonaq. solvent; flame-retardant nonaq. **electrolyte** soln. contg. carbonate compd. as additive for Li battery)

L12 ANSWER 17 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:253130 CAPLUS
DOCUMENT NUMBER: 136:281940
TITLE: Nonaqueous **electrolyte** secondary battery
INVENTOR(S): Sekino, Masahiro; Satoh, Asako; Fujiwara, Masashi; Hasebe, Hiroyuki
PATENT ASSIGNEE(S): Kabushiki Kaisha Toshiba, Japan

SOURCE: Eur. Pat. Appl., 33 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1193788	A2	20020403	EP 2001-308138	20010925
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
CN 1347166	A	20020501	CN 2001-132663	20010907

PRIORITY APPLN. INFO.: JP 2000-296074 A 20000928

AB Disclosed is a nonaq. **electrolyte** secondary battery, characterized by comprising a nonaq. **electrolyte** contg. ethylene carbonate and .gamma.-butyrolactone, wherein, when a charge-discharge cycle test satisfying conditions (A) to (D) given below is performed under an environment of 45.degree., the capacity retention rate at 100-th charge-discharge cycle is at least 85% based on the discharge capacity in the first charge-discharge cycle, (A) for the charging, the const. current-const. voltage charging to 4.2 V is performed for 3 h under a current of 1 C, (B) the discharging is performed to 3 V under a current of 1 C, (C) after the charging, the secondary battery is left to stand for 10 min, followed by performing the discharging, and (D) after the discharging, the secondary battery is left to stand for 10 min, followed by performing the charging.

IT Carbon fibers, uses
RL: DEV (Device component use); USES (Uses)
(mesophase pitch-based; nonaq. **electrolyte** secondary battery)

IT Battery **electrolytes**
Secondary batteries
(nonaq. **electrolyte** secondary battery)

IT Carbonaceous materials (technological products)
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** secondary battery)

IT Carbon black, uses
Fluoropolymers, uses
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** secondary battery)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate **110-00-9**, Furan **110-02-1**, Thiophene **534-22-5**, 2-Methylfuran **2171-74-6**, PyroCatechol carbonate **3741-38-6**, Ethylene sulfite **4427-92-3**, Phenylethylene carbonate **4427-96-7**, Vinylethylene carbonate 7791-03-9, Lithium perchlorate 9002-88-4, Polyethylene 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium hexafluorophosphate 29935-35-1, Lithium hexafluoroarsenate 33454-82-9, Lithium triflate 90076-65-6 111706-40-2, Cobalt lithium oxide CoLi0-102 132843-44-8

RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** secondary battery)

IT 7782-42-5, Graphite, uses 24937-79-9, Pvdf
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** secondary battery)

L12 ANSWER 18 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:163800 CAPLUS
DOCUMENT NUMBER: 136:219519
TITLE: Phenyl boron-based compounds as anion receptors for nonaqueous battery **electrolytes**
INVENTOR(S): Lee, Hung Sui; Yang, Xiao-qing; McBreen, James; Sun, Xuehui
PATENT ASSIGNEE(S): Brookhaven Science Associates, Llc, USA
SOURCE: U.S., 15 pp., Cont.-in-part of U. S. 6,022,643.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 6352798	B1	20020305	US 2000-492569	20000127
US 6022643	A	20000208	US 1997-986846	19971208

PRIORITY APPLN. INFO.: US 1997-986846 A2 19971208
OTHER SOURCE(S): MARPAT 136:219519

AB Novel fluorinated boronate-based compds. which act as anion receptors in nonaq. battery **electrolytes** are provided. When added to nonaq. battery **electrolytes**, the fluorinated boronate-based compds. of the invention enhance ionic cond. and cation transference no. of nonaq. **electrolytes**. The fluorinated boronate-based anion receptors include different fluorinated alkyl and aryl groups.

IT Battery **electrolytes**
Ionic conductivity
(Ph boron-based compds. as anion receptors for nonaq. battery **electrolytes**)

IT Polyanilines
Polyoxyalkylenes, uses
Polysulfides
Transition metal chalcogenides
Transition metal oxides
RL: DEV (Device component use); USES (Uses)
(Ph boron-based compds. as anion receptors for nonaq. battery **electrolytes**)

IT Oxides (inorganic), uses
RL: DEV (Device component use); USES (Uses)
(lithiated; Ph boron-based compds. as anion receptors for nonaq. battery **electrolytes**)

IT Lithium alloy, base
RL: DEV (Device component use); USES (Uses)
(Ph boron-based compds. as anion receptors for nonaq. battery **electrolytes**)

IT 75-05-8, Acetonitrile, uses **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 107-31-3, Methyl formate 108-32-7, Propylene carbonate 109-87-5, Dimethoxymethane 109-99-9, Thf, uses 110-71-4, 1,2-Dimethoxyethane 115-10-6, Dimethyl ether 126-33-0, Sulfolane **534-22-5**, 2-Methylfuran 616-38-6, Dimethyl carbonate 646-06-0, 1,3-Dioxolane 872-50-4, 1-Methyl-2-pyrrolidinone, uses 1072-47-5 1072-71-5, 2,5-Dimercapto-1,3,4-thiadiazole 2923-17-3, Lithium trifluoroacetate 7439-93-2, Lithium, uses 7440-44-0D, Carbon, intercalation compd., with lithium 7447-41-8, Lithium chloride, uses 7550-35-8, Lithium bromide 7789-24-4, Lithium fluoride, uses 7791-03-9, Lithium perchlorate 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 10377-51-2, Lithium iodide 12031-65-1, Lithium nickel oxide linio2 12057-17-9, Lithium manganese oxide limn2o4 12162-79-7, Lithium manganese oxide limno2 12190-79-3, Cobalt lithium oxide colio2 12201-18-2, Lithium molybdenum sulfide limos2 14283-07-9, Lithium tetrafluoroborate 18424-17-4, Lithium hexafluoroantimonate 19836-78-3, 3-Methyl-2-oxazolidinone 21324-40-3, Lithium hexafluorophosphate 25014-41-9, Polyacrylonitrile 25233-30-1, Polyaniline 25322-68-3, Peo 25948-29-2, Carbon disulfide, homopolymer 29935-35-1, Lithium hexafluoroarsenate 39448-96-9, Graphite lithium 55326-82-4, Lithium titanium sulfide litis2 55886-04-9, Lithium niobium selenide Li3NbSe3 87187-79-9, Propanoic acid, pentafluoro-, lithium salt 87442-01-1, Benzoic acid, pentafluoro-, lithium salt 131344-56-4, Cobalt lithium nickel oxide 138187-48-1, Lithium vanadium oxide Li1.2V2O5 152991-98-5, Aluminum lithium nickel oxide 159967-11-0, Lithium magnesium nickel oxide 180984-62-7, Lithium nickel titanium oxide 256345-13-8, Lithium vanadium oxide Li2.5V6O13
RL: DEV (Device component use); USES (Uses)
(Ph boron-based compds. as anion receptors for nonaq. battery **electrolytes**)

IT 23542-71-4P 365458-32-8P 365458-33-9P 365458-34-0P 365458-35-1P 365458-36-2P 365458-37-3P 365458-38-4P 365458-39-5P 365458-40-8P 402564-35-6P 402564-36-7P 402564-37-8P 402564-38-9P 402564-39-0P
RL: DEV (Device component use); MOA (Modifier or additive use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(Ph boron-based compds. as anion receptors for nonaq. battery **electrolytes**)

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 19 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:104914 CAPLUS
DOCUMENT NUMBER: 136:153901
TITLE: Laminar secondary nonaqueous **electrolyte** battery
INVENTOR(S): Yajima, Toru; Yamamoto, Takahiro

PATENT ASSIGNEE(S): A. T. Battery Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002042865	A2	20020208	JP 2000-231562	20000731

PRIORITY APPLN. INFO.: JP 2000-231562 20000731

AB The battery has a stack, contg. a separator between a Li intercalating cathode and a Li intercalating carbonaceous anode, in a package of a laminated film contg. a gas barrier layer in the middle; where the **electrolyte** soln. has LiBF4 dissolved in a .gamma.-butyrolactone or .gamma.-butyrolactone-cyclic carbonate mixed nonaq. solvent, which contains vinylene carbonate, its deriv., and/or vinylethylene carbonate.

IT Packaging materials
(laminated packaging films contg. gas barrier intermediate layers for secondary lithium batteries)

IT Polyimides, uses
RL: MOA (Modifier or additive use); USES (Uses)
(laminated packaging films contg. gas barrier intermediate layers for secondary lithium batteries)

IT Battery **electrolytes**
(solvent mixts. contg. vinylene carbonate and vinylethylene carbonate for **electrolytes** in secondary lithium batteries)

IT 1344-28-1, Alumina, uses 9002-88-4, Polyethylene
RL: MOA (Modifier or additive use); USES (Uses)
(laminated packaging films contg. gas barrier intermediate layers for secondary lithium batteries)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 14283-07-9, Lithium fluoroborate
RL: DEV (Device component use); USES (Uses)
(solvent mixts. contg. vinylene carbonate and vinylethylene carbonate for **electrolytes** in secondary lithium batteries)

IT 872-36-6, Vinylene carbonate **4427-96-7**, Vinylethylene carbonate
RL: MOA (Modifier or additive use); USES (Uses)
(solvent mixts. contg. vinylene carbonate and vinylethylene carbonate for **electrolytes** in secondary lithium batteries)

L12 ANSWER 20 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:84081 CAPLUS
DOCUMENT NUMBER: 136:137403
TITLE: **Electrolyte** for a lithium-sulfur battery
INVENTOR(S): Hwang, Duckchul; Choi, Yunsuk; Choi, Sooseok; Lee, Jeawoan; Jung, Yongju; Kim, Joosoak
PATENT ASSIGNEE(S): Samsung SDI Co. Ltd., S. Korea
SOURCE: Eur. Pat. Appl., 7 pp.

CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1176659	A2	20020130	EP 2001-117661	20010725
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002075447	A2	20020315	JP 2001-213435	20010713
US 2002102466	A1	20020801	US 2001-910952	20010724
CN 1335653	A	20020213	CN 2001-132526	20010725

PRIORITY APPLN. INFO.: KR 2000-42736 A 20000725
KR 2000-42737 A 20000725

AB An **electrolyte** for a lithium-sulfur battery has a solvent having a dielec. const. that is greater than or equal to 20, a solvent having a viscosity that is less than or equal to 1.3, and an **electrolyte** salt. This battery shows excellent capacity and cycle life characteristics.

IT Battery **electrolytes**
(**electrolyte** for lithium-sulfur battery)

IT Secondary batteries
(lithium; **electrolyte** for lithium-sulfur battery)

IT 60-29-7, Ethyl ether, uses 64-17-5, Ethanol, uses 67-56-1, Methanol, uses 67-63-0, Isopropanol, uses 67-68-5, Dmso, uses 68-12-2, Dmf, uses 71-43-2, Benzene, uses 75-05-8, Acetonitrile, uses 78-93-3, Methylethyl ketone, uses 79-20-9, Methyl acetate 96-47-9, 2-Methyltetrahydrofuran **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-37-3, Ethyl propionate 105-58-8, Diethyl carbonate 107-31-3, Methyl formate 108-32-7, Propylene carbonate 109-60-4, n-Propyl acetate 109-99-9, Thf, uses 110-71-4, 1,2-Dimethoxyethane 110-82-7, Cyclohexane, uses 110-86-1, Pyridine, uses 111-96-6, Diglyme 123-91-1, p-Dioxane, uses 126-33-0, Sulfolane 141-78-6, Ethyl acetate, uses 420-12-2, Ethylene sulfide 462-06-6, Fluorobenzene 554-12-1, Methyl propionate 616-38-6, Dimethyl carbonate 623-53-0, Ethylmethyl carbonate 646-06-0, 1,3-Dioxolane 680-31-9, Hexamethylphosphoramide, uses 822-38-8, Ethylene trithiocarbonate 872-36-6, Vinylene carbonate 930-35-8, Vinylene trithiocarbonate **3741-38-6**, Ethylene sulfite 7704-34-9, Sulfur, uses 7791-03-9, Lithium perchlorate 14283-07-9, Lithium tetrafluoroborate 16508-95-5, Bismuth carbonate 21324-40-3, Lithium hexafluorophosphate 25496-08-6, Fluorotoluene 29935-35-1, Lithium hexafluoroarsenate 33454-82-9, Lithium triflate 74432-42-1, Lithium polysulfide 90076-65-6
RL: DEV (Device component use); USES (Uses)
(**electrolyte** for lithium-sulfur battery)

L12 ANSWER 21 OF 33 CAPLUS COPYRIGHT 2003 ACS

ACCESSION NUMBER: 2002:66770 CAPLUS
DOCUMENT NUMBER: 136:121064
TITLE: Nonaqueous **electrolyte** lithium secondary battery
INVENTOR(S): Iwamoto, Kazuyu; Oura, Takafumi; Hatazaki, Makino; Yoshizawa, Hiroshi; Sonoda, Kumiko; Nakanishi, Shinji
PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan
SOURCE: Eur. Pat. Appl., 31 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1174940	A1	20020123	EP 2001-117048	20010712
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2002033119	A2	20020131	JP 2000-215518	20000717
JP 2002033120	A2	20020131	JP 2000-215519	20000717
JP 2002033124	A2	20020131	JP 2000-215520	20000717
US 2002039677	A1	20020404	US 2001-901130	20010710
CN 1333580	A	20020130	CN 2001-123135	20010717

PRIORITY APPLN. INFO.: JP 2000-215518 A 20000717
JP 2000-215519 A 20000717
JP 2000-215520 A 20000717

AB The invention relates to a nonaq. electrochem. app. in which the difference (.gamma.l-.gamma.se) between the surface tension .gamma.l of nonaq. **electrolyte** and the surface free energy .gamma.se of electrode is not more than 10 dynes/cm. The nonaq. **electrolyte** contains a F-contg. surface active agent.

IT Carboxylic acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(C2-20, fluoroalkyl; nonaq. **electrolyte** lithium secondary battery)

IT Sulfonic acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(alkanesulfonic, sodium salts, fluoro-; nonaq. **electrolyte** lithium secondary battery)

IT Anhydrides
Ethers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(cyclic; nonaq. **electrolyte** lithium secondary battery)

IT Carboxylic acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(esters, cyclic; nonaq. **electrolyte** lithium secondary battery)

IT Secondary batteries
(lithium; nonaq. **electrolyte** lithium secondary battery)

IT Battery electrodes
Battery **electrolytes**
Surface free energy
Surface tension
Surfactants
(nonaq. **electrolyte** lithium secondary battery)

IT Carbonaceous materials (technological products)
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT Cyclic compounds
RL: MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT Lactones
RL: MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT Fluoropolymers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT 463-79-6D, Carbonic acid, esters 1343-98-2D, Silicic acid, esters
7664-38-2D, Phosphoric acid, esters 7664-93-9D, Sulfuric acid, esters
7697-37-2D, Nitric acid, esters 7782-77-6D, Nitrous acid, esters
7782-99-2D, Sulfurous acid, esters 10043-35-3D, Boric acid, esters
13598-36-2D, Phosphorous acid, esters
RL: MOA (Modifier or additive use); USES (Uses)
(cyclic; nonaq. **electrolyte** lithium secondary battery)

IT 79-20-9, Methyl acetate 85-44-9, Phthalic anhydride **96-48-0**,
.gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-54-4,
Ethyl butyrate 105-58-8, Diethyl carbonate 108-29-2,
.gamma.-Valerolactone 108-30-5, Succinic anhydride, uses 108-32-7,
Propylene carbonate 109-60-4, n-Propyl acetate 123-86-4, Butyl acetate
140-11-4, Benzyl acetate 141-78-6, Ethyl acetate, uses 517-23-7,
.alpha.-Acetyl-.gamma.-butyrolactone 540-42-1, Isobutyl propionate
554-12-1, Methyl propionate 616-02-4, Citraconic anhydride 616-38-6,
Dimethyl carbonate 623-53-0, Ethylmethyl carbonate 1679-47-6,
.alpha.-Methyl-.gamma.-butyrolactone 2170-03-8, Itaconic anhydride
2453-03-4, 1,3-Dioxan-2-one 7782-42-5, Graphite, uses 9002-88-4,
Polyethylene 14283-07-9, Lithium tetrafluoroborate 21324-40-3, Lithium
hexafluorophosphate 52627-24-4, Cobalt lithium oxide 52876-41-2,
Trimethylene borate 90076-65-6 132843-44-8 201416-30-0,
4,5-Diphenyl-1,3,2-dioxathiole-2,2-dioxide 389604-01-7
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT 77-79-2, Sulfolene 102-09-0, Diphenyl carbonate 126-33-0, Sulfolane
463-79-6D, Carbonic acid, ester 822-38-8, Ethylene trithiocarbonate
872-36-6, Vinylene carbonate 872-93-5, 3-MethylSulfolane 930-35-8,
Vinylene trithiocarbonate 1120-71-4, Propanesultone 1600-44-8
1633-83-6, 1,4-Butanesultone **2171-74-6**, 1,3-Benzodioxol-2-one
2965-52-8 **3741-38-6**, Ethylene sulfite 3967-54-2,
Chloroethylene carbonate 4236-15-1 **4427-92-3**, Phenylethylene
carbonate **4427-96-7**, Vinylethylene carbonate 6255-58-9

7440-44-0, Carbon, uses 7704-34-9D, Sulfur, ester 16761-08-3
21240-34-6 37228-47-0, Ethylene phosphite 40630-61-3 52550-45-5
75032-95-0, Disodium N-perfluorooctanesulfonylglutamate 75046-16-1
122036-85-5 324547-56-0 366787-88-4
RL: MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

IT 24937-79-9, Pvdf
RL: TEM (Technical or engineered material use); USES (Uses)
(nonaq. **electrolyte** lithium secondary battery)

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 22 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2002:47936 CAPLUS
DOCUMENT NUMBER: 136:105137
TITLE: Nonaqueous **electrolyte** solution and secondary nonaqueous **electrolyte** battery
INVENTOR(S): Sekino, Masahiro; Fujiwara, Masashi; Sato, Asako; Kadoma, Shun; Koguchi, Masayuki; Kato, Makoto; Hasebe, Hiroyuki
PATENT ASSIGNEE(S): Toshiba Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 28 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2002015771	A2	20020118	JP 2001-54937	20010228
CN 1373529	A	20021009	CN 2001-135832	20011025
US 2002164531	A1	20021107	US 2001-985369	20011102

PRIORITY APPLN. INFO.: JP 2000-131615 A 20000428
JP 2001-54937 A 20010228

AB The **electrolyte** soln. has a Li salt dissolved in a nonaq. solvent, where the solvent contains ethylene carbonate 15-50, propylene carbonate 2-35, .gamma.-butyrolactone 30-85,, and a 4th component 0-5 vol.%. The 4th component is selected from vinylene carbonate, vinyl ethylene carbonate, ethylene sulfite, , Ph ethylene carbonate, 12-crown-4, and tetraethylene glycol di-Me ether; and may contain a 5th component when the 4th component is vinylene carbonate. The battery has the **electrolyte** soln. retained in an electrode stack in a .ltoreq.0.3 mm thick package.

IT Battery **electrolytes**
(compns. of carbonate ester based **electrolyte** solvent mixts. for secondary lithium batteries)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 14283-07-9, Lithium fluoroborate

RL: DEV (Device component use); USES (Uses)
(compns. of carbonate ester based **electrolyte** solvent mixts. for secondary lithium batteries)

IT 143-24-8, Tetraethylene glycol dimethyl ether 294-93-9, 12-Crown-4 872-36-6, Vinylene carbonate **3741-38-6**, Ethylene sulfite **4427-92-3**, Phenylethylene carbonate **4427-96-7**, Vinyl ethylene carbonate
RL: MOA (Modifier or additive use); USES (Uses)
(compns. of carbonate ester based **electrolyte** solvent mixts. for secondary lithium batteries)

L12 ANSWER 23 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2001:759631 CAPLUS
DOCUMENT NUMBER: 135:306245
TITLE: Nonaqueous **electrolyte** secondary battery
INVENTOR(S): Hatazaki, Makino; Iwamoto, Kazuya; Sonoda, Kumiko; Yoshizawa, Hiroshi
PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan
SOURCE: Eur. Pat. Appl., 13 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1146586	A2	20011017	EP 2001-303366	20010410
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
JP 2001297790	A2	20011026	JP 2000-109268	20000411
US 2001038949	A1	20011108	US 2001-828941	20010410
CN 1317845	A	20011017	CN 2001-116833	20010411

PRIORITY APPLN. INFO.: JP 2000-109268 A 20000411
OTHER SOURCE(S): MARPAT 135:306245
AB A nonaq. **electrolyte** secondary battery having excellent charge/discharge characteristics and a long cycle life, and generating a smaller amt. of gas during storage than conventional batteries, comprises a pos. electrode; a neg. electrode; and a nonaq. **electrolyte** comprising a nonaq. solvent and a solute dissolved therein. This improvement is achieved by adding to the nonaq. **electrolyte** a surface active agent represented by the general formula : X-CnF2n-Y-(CH2-CH2)m-Z; where X is H or F, Y is -CONH- or -SO2NR- in which R is an alkyl group, Z is -OH, -CH3, -PO3W2 or -SO3W in which W is an alkali metal, 4 .ltoreq. n .ltoreq. 10, and 20 .ltoreq. m .ltoreq. 100.
IT Oxides (inorganic), uses
RL: DEV (Device component use); USES (Uses)
(lithiated; nonaq. **electrolyte** secondary battery)
IT Battery **electrolytes**
Secondary batteries

Surfactants
(nonaq. **electrolyte** secondary battery)

IT Carbonaceous materials (technological products)
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** secondary battery)

IT **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate
623-53-0, Ethyl methyl carbonate
RL: DEV (Device component use); USES (Uses)
(nonaq. **electrolyte** secondary battery)

IT 77-79-2, Sulfolene **96-48-0**, .gamma.-Butyrolactone 102-09-0,
Diphenyl carbonate 105-58-8, Diethyl carbonate 126-33-0, Sulfolane
274-17-9, 1,3,2-Benzodioxathiole 420-12-2, Ethylene sulfide 616-38-6,
Dimethyl carbonate 822-38-8, Ethylene trithiocarbonate 872-36-6,
Vinylene carbonate 872-93-5, 3-Methylsulfolane 930-35-8,
1,3-Dithiole-2-thione 1120-71-4, Propanesultone 1633-83-6,
1,4-Butanesultone **2171-74-6**, 1,3-Benzodioxol-2-one 3967-54-2,
Chloroethylene carbonate **4427-92-3**, Phenylethylene carbonate
4427-96-7, Vinylethylene carbonate 16761-08-3 21240-34-6
39700-44-2 122036-85-5 324547-56-0 366784-73-8 366787-88-4
RL: MOA (Modifier or additive use); USES (Uses)
(nonaq. **electrolyte** secondary battery)

L12 ANSWER 24 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2000:911605 CAPLUS
DOCUMENT NUMBER: 134:74022
TITLE: Secondary nonaqueous **electrolyte** batteries
INVENTOR(S): Kotato, Minoru; Fujii, Takashi; Shima, Noriko; Suzuki, Hitoshi
PATENT ASSIGNEE(S): Mitsubishi Chemical Corporation, Japan
SOURCE: PCT Int. Appl., 29 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2000079632	A1	20001228	WO 2000-JP3910	20000615
W: CN, US				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
JP 2001006729	A2	20010112	JP 1999-172405	19990618
JP 2001126761	A2	20010511	JP 1999-304847	19991027
EP 1205996	A1	20020515	EP 2000-937252	20000615
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI, CY				

PRIORITY APPLN. INFO.: JP 1999-172405 A 19990618
JP 1999-304847 A 19991027
WO 2000-JP3910 W 20000615

OTHER SOURCE(S): MARPAT 134:74022
AB The batteries have a cathode, an anode, and an **electrolyte** soln. contg. a Li salt dissolved in a nonaq. solvent; where the solvent contains 0.01-20% vinylethylene carbonate I, where R1-6 are H or C1-4 alkyl groups.
IT Battery anodes
(characteristics of graphite for anodes in secondary lithium batteries contg. vinylethylene carbonate ii **electrolyte** solns.)
IT Battery **electrolytes**
(solvent mixs. contg. vinylethylene carbonate for lithium salt **electrolytes** in secondary lithium batteries)
IT 7782-42-5, Graphite, uses
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(artificial; characteristics of graphite for anodes in secondary lithium batteries contg. vinylethylene carbonate ii **electrolyte** solns.)
IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-58-8, Diethyl carbonate 108-32-7, Propylene carbonate
RL: DEV (Device component use); USES (Uses)
(solvent mixs. contg. vinylethylene carbonate for lithium salt **electrolytes** in secondary lithium batteries)
IT **4427-96-7**, Vinylethylene carbonate
RL: MOA (Modifier or additive use); USES (Uses)
(solvent mixs. contg. vinylethylene carbonate for lithium salt **electrolytes** in secondary lithium batteries)
IT 21324-40-3, Lithium hexafluorophosphate
RL: DEV (Device component use); USES (Uses)
(solvent mixts. contg. vinylethylene carbonate for lithium salt **electrolytes** in secondary lithium batteries)
REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 25 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2000:367148 CAPLUS
DOCUMENT NUMBER: 132:350275
TITLE: Alkali metal electrochemical cell having an improved cathode activated with a nonaqueous **electrolyte** having a passivation inhibitor additive
INVENTOR(S): Takeuchi, Esther S.; Leising, Randolph A.; Gan, Hong
PATENT ASSIGNEE(S): Wilson Greatbatch Ltd., USA
SOURCE: Eur. Pat. Appl., 18 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1005098	A2	20000531	EP 1999-308910	19991109

EP 1005098 A3 20020410
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO
US 6221534 B1 20010424 US 1998-200304 19981125
JP 2000164251 A2 20000616 JP 1999-334319 19991125
PRIORITY APPLN. INFO.: US 1998-200304 A 19981125
OTHER SOURCE(S): MARPAT 132:350275

AB The present invention is directed to an unexpected benefit in a lithium cell which may be derived from using a combination of silver vanadium oxide prepd. in a temp. range of 450.degree. to 500.degree. activated with a nonaq. **electrolyte** having a passivation inhibitor additive selected from a nitrite, a nitrate, a carbonate, a dicarbonate, a phosphonate, a phosphate, a sulfate and hydrogen fluoride, and mixts. thereof. The benefits may include addnl. battery life resulting from a redn. in voltage delay and RDC build-up. A preferred **electrolyte** is 1M LiAsF6 in a 50:50 mixt., by vol., of PC and DME having dibenzyl carbonate added therein.

IT Air
Battery cathodes
(alkali metal battery having improved cathode activated with nonaq. **electrolyte** having passivation inhibitor additive)

IT Transition metal chalcogenides
RL: DEV (Device component use); USES (Uses)
(alkali metal battery having improved cathode activated with nonaq. **electrolyte** having passivation inhibitor additive)

IT 1313-13-9, Manganese dioxide, uses 1313-99-1, Nickel oxide nio, uses 1344-70-3, Copper oxide 7439-93-2, LIthium, uses 11104-61-3, Cobalt oxide 11105-02-5, Silver vanadium oxide 11115-78-9, Copper sulfide 11126-12-8, Iron sulfide 12039-13-3, Titanium disulfide 12068-85-8, Iron disulfide 12789-09-2, Copper vanadium oxide 181183-66-4, Copper silver vanadium oxide
RL: DEV (Device component use); USES (Uses)
(alkali metal battery having improved cathode activated with nonaq. **electrolyte** having passivation inhibitor additive)

IT 67-68-5, Dmso, uses 68-12-2, Dmf, uses 75-05-8, Acetonitrile, uses 79-20-9, Methyl acetate **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 105-58-8 108-20-3, Diisopropyl ether 108-29-2, .gamma.-Valerolactone 108-32-7, Propylene carbonate 109-99-9, uses 110-71-4, 1,2-Dimethoxyethane 111-96-6 112-49-2, Triglyme 127-19-5, Dimethyl acetamide 143-24-8, Tetraglyme 556-65-0, Lithium thiocyanate 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 623-96-1, Dipropyl carbonate 629-14-1, 1,2-Diethoxyethane 2923-17-3 2923-20-8 4437-85-8, Butylene carbonate 5137-45-1, 1-Ethoxy-2-methoxyethane 7790-69-4, Lithium nitrate 7791-03-9 13453-75-3, Lithium fluorosulfate 14024-11-4, Lithium tetrachloroaluminate 14283-07-9, Lithium tetrafluoroborate 14485-20-2, LIthium tetraphenylborate 15955-98-3, Lithium tetrachlorogallate 18424-17-4, Lithium hexafluoroantimonate 21324-40-3, Lithium hexafluorophosphate 29935-35-1, Lithium hexafluoroarsenate 30207-69-3, -Methylpyrrolidinone 33454-82-9, LIthium triflate 35363-40-7, Ethyl

propyl carbonate 56525-42-9, Methyl propyl carbonate 90076-65-6
132404-42-3
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(alkali metal battery having improved cathode activated with nonaq. **electrolyte** having passivation inhibitor additive)

IT 57-52-3, Bis(triethyltin)sulfate 64-67-5, Diethyl sulfate 77-78-1, Dimethyl sulfate 107-66-4 109-95-5, Ethyl nitrite 540-80-7, tert-Butyl nitrite 541-42-4, Isopropyl nitrite 542-56-3, Isobutyl nitrite 543-29-3, Isobutyl nitrate 543-67-9, Propyl nitrite 544-16-1, Butyl nitrite 598-02-7, Diethyl phosphate 598-05-0, Dipropyl sulfate 624-91-9, Methyl nitrite 625-22-9, Dibutyl sulfate 627-13-4, Propyl nitrate 683-08-9, Diethyl methyl phosphonate 701-64-4, Mono-phenyl phosphate 756-79-6, Dimethyl methyl phosphonate 762-04-9, Diethyl phosphonate 773-47-7, Dimethyl benzylphosphonate 812-00-0, Mono-methyl phosphate 813-78-5, Dimethyl phosphate 838-85-7, Diphenyl phosphate 868-85-9, Dimethyl phosphonate 884-90-2, Phosphoric acid, diethyl phenylmethyl ester 926-05-6, tert-Butyl nitrate 928-45-0, Butyl nitrate 935-05-7, Benzyl nitrite 1469-70-1, Allyl ethyl carbonate 1610-33-9, Ethyl methyl phosphonate 1623-06-9, Mono-propyl phosphate 1623-07-0, Benzyl phosphate 1623-08-1, Dibenzyl phosphate 1623-14-9, Mono-ethyl phosphate 1623-15-0, Mono-butyl phosphate 1707-92-2, Tribenzyl phosphate 1712-64-7, Isopropyl nitrate 1804-93-9, Dipropyl phosphate 1809-19-4, Dibutyl phosphonate 1809-21-8, Dipropyl phosphonate 2104-20-3, Phenyl nitrate 2404-73-1, Dibutyl methyl phosphonate 2649-11-8, Didodecyl sulfate 3066-75-9, Phosphoric acid, diethyl 2-propenyl, ester 3459-92-5, Dibenzyl carbonate 4074-56-0, Diphenyl sulfate **4427-92-3**, 4-Phenyl-1,3-dioxolan-2-one 4712-55-4, Diphenyl phosphonate 5944-45-6, Dicarbonic acid, methyl 2-propenyl ester 5944-47-8, Dicarbonic acid, ethyl phenylmethyl ester 6410-56-6, Dipropyl methyl phosphonate 7526-26-3, Diphenyl methyl phosphonate 7664-38-2, Phosphoric acid, uses 7748-09-6, Diallyl phosphate 7757-79-1, Potassium nitrate, uses 10124-37-5, Calcium nitrate 10377-60-3, Magnesium nitrate 10497-05-9, Tris(trimethylsilyl)phosphate 13598-36-2, Phosphorous acid, uses 15022-08-9, Diallyl carbonate 15285-42-4, Benzyl nitrate 17176-77-1, Dibenzyl phosphonate 18306-29-1, Bis(trimethylsilyl)sulfate 18495-74-4, Dibenzyl sulfate 19236-58-9, Dibenzyl methyl phosphonate 24424-99-5, Di-tert-butyl dicarbonate 27991-93-1, Sulfuric acid, Bis(4-nitrophenyl) ester, uses 28519-15-5, Phosphoric acid, dibutyl phenylmethyl ester 31139-36-3, Dibenzyl dicarbonate 32636-65-0, Phosphoric acid, diphenylmethyl diethyl ester 34207-39-1, Nitrous acid, phenyl ester 54963-39-2, Phosphonic acid, (diphenylmethyl)-, dimethyl ester 57772-64-2 59577-32-1 66065-85-8, Succinimidyl-2,2,2-trichloroethyl carbonate 66085-82-3, Dicarbonic acid, methylphenyl ester 66186-16-1, Didecyl sulfate 66735-55-5, Methyl Phenyl sulfate 72101-14-5, Phosphoric acid, Dimethyl methylphenyl ester 74124-79-1 104184-81-8, Sulfuric acid, 2-chloroethyl ethyl ester 115491-93-5, Diallyl dicarbonate 116977-36-7, Dicarbonic acid, ethyl 2-propenyl ester 246140-06-7, Dicarbonic acid, methyl phenylmethyl ester 246140-07-8,

Dicarbonic acid, phenylmethyl propyl ester 246140-10-3, Dicarbonic acid, butyl phenylmethyl ester 246140-17-0, Dicarbonic acid, mono-2-propenyl ester 246140-18-1, Dicarbonic acid, 2-propenyl propyl ester 246140-20-5, Dicarbonic acid, mono-methyl ester 246140-22-7, Dicarbonic acid, mono-ethyl ester 246140-24-9, Dicarbonic acid, mono-propyl ester 246140-26-1, Dicarbonic acid, mono-butyl ester 246140-27-2, Dicarbonic acid, cyanomethyl methyl ester 246140-29-4, Dicarbonic acid, methyl nitromethyl ester 269402-58-6 269402-59-7 269402-60-0
RL: MOA (Modifier or additive use); USES (Uses)
(alkali metal battery having improved cathode activated with nonaq. **electrolyte** having passivation inhibitor additive)

IT 534-16-7, Silver carbonate 563-63-3, Silver acetate 1314-62-1, Vanadium pentoxide, reactions 7440-22-4, Silver, reactions 7761-88-8, Silver nitrate, reactions 7783-99-5, Silver nitrite 20667-12-3, Silver oxide ag2o
RL: RCT (Reactant); RACT (Reactant or reagent)
(alkali metal battery having improved cathode activated with nonaq. **electrolyte** having passivation inhibitor additive)

IT 7440-37-1, Argon, uses 7440-59-7, Helium, uses 7727-37-9, Nitrogen, uses 7782-44-7, Oxygen, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(alkali metal battery having improved cathode activated with nonaq. **electrolyte** having passivation inhibitor additive)

L12 ANSWER 26 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 2000:95943 CAPLUS
DOCUMENT NUMBER: 132:125353
TITLE: Boron compounds as anion binding agents for nonaqueous battery **electrolytes**
INVENTOR(S): Lee, Hung Sui; Yang, Xia-oing; McBreen, James; Xiang, Caili
PATENT ASSIGNEE(S): Brookhaven Science Associates, USA
SOURCE: U.S., 11 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 6022643	A	20000208	US 1997-986846	19971208
US 6352798	B1	20020305	US 2000-492569	20000127

PRIORITY APPLN. INFO.: US 1997-986846 A2 19971208

AB Novel fluorinated boron-based compds. which act as anion receptors in nonaq. battery **electrolytes** are provided. The anion receptor is a compd. of formula Q3B, where Q is a F-bearing moiety selected from the group of (CF3)2CHO, (CF3)2C(C6H5)O, (CF3)3CO, FC6H4O, F2C6H3O, F4C6HO, C6F5O, CF3C6H4O, and (CF3)2C6H3O. When added to nonaq. battery **electrolytes**, the fluorinated boron-based compds. of the invention

enhance ionic cond. and cation transference no. of nonaq. **electrolytes**. The fluorinated boron-based anion receptors include borane and borate compds. bearing different fluorinated alkyl and aryl groups.

IT Battery **electrolytes**
Ionic conductivity
(boron compds. as anion binding agents for nonaq. battery **electrolytes**)

IT Intercalation compounds
Polyanilines
Polyoxyalkylenes, uses
Transition metal chalcogenides
Transition metal oxides
RL: DEV (Device component use); USES (Uses)
(boron compds. as anion binding agents for nonaq. battery **electrolytes**)

IT Oxides (inorganic), uses
RL: DEV (Device component use); USES (Uses)
(intercalation compd. with lithium; boron compds. as anion binding agents for nonaq. battery **electrolytes**)

IT Secondary batteries
(lithium; boron compds. as anion binding agents for nonaq. battery **electrolytes**)

IT Polysulfides
RL: DEV (Device component use); USES (Uses)
(org.; boron compds. as anion binding agents for nonaq. battery **electrolytes**)

IT Lithium alloy
RL: DEV (Device component use); USES (Uses)
(boron compds. as anion binding agents for nonaq. battery **electrolytes**)

IT 75-05-8, Acetonitrile, uses **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 107-31-3, Methyl formate 108-32-7, Propylene carbonate 109-87-5, Dimethoxymethane 109-99-9, uses 110-71-4, 1,2-Dimethoxyethane 115-10-6, Dimethyl ether 126-33-0, Sulfolane **534-22-5**, 2-Methylfuran 616-38-6, Dimethyl carbonate 646-06-0, 1,3-Dioxolane 872-50-4, uses 1072-47-5, 1,3-Dioxolane, 4-Methyl 1072-71-5, 2,5-Dimercapto-1,3,4-thiadiazole 2923-17-3, Lithium trifluoroacetate 7439-93-2, Lithium, uses 7439-93-2D, Lithium, intercalation compd. with carbon, uses 7440-44-0D, Carbon, intercalation compd. with lithium, uses 7447-41-8, Lithium chloride, uses 7550-35-8, Lithium bromide 7789-24-4, Lithium fluoride, uses 7791-03-9 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 10377-51-2, Lithium iodide 12031-65-1, Lithium nickel oxide linio2 12057-17-9, Lithium manganese oxide limn2o4 12162-79-7, Lithium manganese oxide limno2 12190-79-3, Cobalt lithium oxide colio2 12201-18-2, Lithium molybdenum sulfide limos2 14283-07-9, Lithium tetrafluoroborate 18424-17-4, Lithium hexafluoroantimonate 19836-78-3, 3-Methyl-2-oxazolidinone 21324-40-3, Lithium hexafluorophosphate 25014-41-9, Polyacrylonitrile 25233-30-1, Polyaniline 25322-68-3

25948-29-2, Carbon disulfide, homopolymer 29935-35-1, Lithium hexafluoroarsenate 39448-96-9, Graphite lithium 55326-82-4, Lithium titanium sulfide litis2 55886-04-9, Lithium niobium selenide Li3NbSe3 87187-79-9 87442-01-1, Benzoic acid, pentafluoro-, lithium salt 138187-48-1, Lithium vanadium oxide Li1.2V2O5 256345-13-8, Lithium vanadium oxide (Li2.5V6O13)
RL: DEV (Device component use); USES (Uses)
(boron compds. as anion binding agents for nonaq. battery **electrolytes**)

IT 121-43-7 659-18-7 755-53-3 856-46-2 1095-03-0 1109-15-5 6919-80-8 32766-52-2 146355-12-6 210834-28-9 210834-35-8 210834-37-0 210834-40-5 210834-42-7
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(boron compds. as anion binding agents for nonaq. battery **electrolytes**)

REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 27 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 1999:708059 CAPLUS
DOCUMENT NUMBER: 131:325053
TITLE: **Electrolytes** for lithium secondary batteries
INVENTOR(S): Kominato, Asao; Yasukawa, Shigeki; Mori, Shoichiro
PATENT ASSIGNEE(S): Mitsubishi Chemical Industries Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 11307121	A2	19991105	JP 1998-111795	19980422

PRIORITY APPLN. INFO.: JP 1998-111795 19980422
OTHER SOURCE(S): MARPAT 131:325053

AB The **electrolytes** comprise Li salt, std. temp. molten salt of quaternary imidazolium I (R1, R3 = C1-6 alkyl; R2 = H, C1-6 alkyl) or quaternary pyridinium II (R6 = C1-10 alkyl; R4, R5 = H, C1-6 alkyl), and 1-130 vol.% cyclic org. compds. The **electrolytes** have fire resistance and give secondary lithium batteries with excellent cycle characteristics.

IT Ethers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(cyclic; nonaq. **electrolytes** for lithium secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

IT Pyridinium compounds
RL: TEM (Technical or engineered material use); USES (Uses)
(**electrolytes**; nonaq. **electrolytes** for lithium

secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

IT Quaternary ammonium compounds, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(imidazolinium, **electrolytes**; nonaq. **electrolytes** for lithium secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

IT Battery **electrolytes**
Fire-resistant materials
(nonaq. **electrolytes** for lithium secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

IT Lactones
RL: TEM (Technical or engineered material use); USES (Uses)
(nonaq. **electrolytes** for lithium secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

IT Cyclic compounds
RL: TEM (Technical or engineered material use); USES (Uses)
(sulfur-contg.; nonaq. **electrolytes** for lithium secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 108-98-5, Thiophenol, uses 109-99-9, Tetrahydrofuran, uses 123-91-1, 1,4-Dioxane, uses 126-33-0, Sulfolane 142-68-7, Tetrahydropyran 646-06-0, 1,3-Dioxolane 1120-71-4, 1,3-Propanesultone **3741-38-6**, Ethylene sulfite
RL: TEM (Technical or engineered material use); USES (Uses)
(**electrolyte** solvent; nonaq. **electrolytes** for lithium secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

IT 14024-11-4, Lithium tetrachloroaluminate 14283-07-9, Lithium tetrafluoroborate 80432-05-9, 1-Ethyl-3-methylimidazolium tetrachloroaluminate(1-) 143314-16-3, 1-Ethyl-3-methylimidazolium tetrafluoroborate 203389-28-0, N-Butylpyridinium tetrafluoroborate
RL: TEM (Technical or engineered material use); USES (Uses)
(**electrolyte**; nonaq. **electrolytes** for lithium secondary batteries contg. imidazolium or pyridinium salts and cyclic compd. solvents)

L12 ANSWER 28 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 1999:224763 CAPLUS
DOCUMENT NUMBER: 130:225404
TITLE: Nonaqueous **electrolyte** batteries
INVENTOR(S): Sato, Tomohiro; Mori, Shoichiro; Deshamps, Marc; Kotato, Minoru; Shima, Noriko; Suzuki, Hitoshi
PATENT ASSIGNEE(S): Mitsubishi Chemical Corporation, Japan
SOURCE: PCT Int. Appl., 39 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9916144	A1	19990401	WO 1998-JP4181	19980917
W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
JP 2002216841	A2	20020802	JP 1997-278626	19971013
JP 2002216850	A2	20020802	JP 1998-111794	19980422
AU 9890951	A1	19990412	AU 1998-90951	19980917
JP 11162511	A2	19990618	JP 1998-263140	19980917
EP 1030399	A1	20000823	EP 1998-943020	19980917
R: DE				

PRIORITY APPLN. INFO.: JP 1997-254802 A 19970919
JP 1997-278626 A 19971013
JP 1998-111794 A 19980422
WO 1998-JP4181 W 19980917

OTHER SOURCE(S): MARPAT 130:225404

AB The batteries have a Li anode, a cathode, a nonaq. **electrolyte** contg. a solute and an org. solvent, a separator, and a battery case; where the solvent contains a compd. RAR' [R and R' are (aryl- or halogen-substituted) alkyl group or (alkyl- or halogen-substituted) aryl group; A = -OSO2-, -SO2-, -SO3-,or -SO4-; and R, R', and A may form a ring], and the cathode collector and the cathode side of the battery case contacting the **electrolyte** are composed of a metal, which forms a passivation film in **electrolyte**, or its alloy.

IT Battery **electrolytes**
(**electrolyte** solvents in lithium batteries with readily passivated metals for cathode collectors and battery case linings)

IT Secondary batteries
(lithium; secondary lithium batteries with readily passivated metals for cathode collectors and battery case linings)

IT Battery cathodes
(secondary lithium batteries with readily passivated metals for cathode collectors and battery case linings)

IT 77-79-2, Sulfolene **96-48-0**, .gamma.-Butyrolactone
96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate
109-99-9, Thf, uses 126-33-0, Sulfolane 554-12-1, Methyl propionate
616-42-2, Dimethyl sulfite 1120-71-4, 1,3-Propanesultone
3741-38-6, Ethylene sulfite
RL: DEV (Device component use); USES (Uses)
(**electrolyte** solvents in lithium batteries with readily passivated metals for cathode collectors and battery case linings)

IT 7429-90-5, Aluminum, uses 7440-03-1, Niobium, uses 7440-25-7,

Tantalum, uses 7440-32-6, Titanium, uses 7440-58-6, Hafnium, uses 7440-67-7, Zirconium, uses
RL: DEV (Device component use); USES (Uses)
(secondary lithium batteries with readily passivated metals for cathode collectors and battery case linings)
REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L12 ANSWER 29 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 1997:273673 CAPLUS
DOCUMENT NUMBER: 126:253368
TITLE: Lithium batteries using improved **electrolytes**
INVENTOR(S): Jinno, Maruo; Uehara, Mayumi; Yanai, Atsushi; Nishio, Koji; Saito, Toshihiko
PATENT ASSIGNEE(S): Sanyo Denki Kk, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 09045339	A2	19970214	JP 1995-212880	19950728
PRIORITY APPLN. INFO.:			JP 1995-212880	19950728

ABSTR ...eries use LiCF3SO3 or LiPF6 **electrolyte** dissolved in an ...e carbonate based solvent mixt. contg. 1-20 vol.% chain monoethers, cha... ...riethers, chain tetraethers, cyclic ethers, chain carbonate esters, lactones, 3-Pr sydnone, and/or C6H6. The batteries have low self discharge.

IT Battery **electrolytes**
(compns. of ethylene carbonate based **electrolyte** solvent mixts. for lithium batteries)

IT 57-57-8, 2-Oxetanone 71-43-2, Benzene, uses 96-47-9, 2-Methyltetrahydrofuran **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 100-66-3, Methyl phenyl ether, uses 105-58-8, Diethyl carbonate 108-20-3, Isopropyl ether 108-29-2, .gamma.-Valerolactone 109-99-9, Tetrahydrofuran, uses **110-00-9**, Furan 111-96-6, Diethylene glycol dimethyl ether 112-36-7, Diethylene glycol diethyl ether 115-10-6, Dimethyl ether 122-31-6, 1,1,3,3-Tetraethoxypropane 122-51-0, Triethoxymethane 149-73-5, Trimethoxymethane 497-26-7, 2-Methyldioxolane **534-22-5**, 2-Methylfuran 542-28-9, .delta.-Valerolactone 616-38-6, Dimethyl carbonate 623-53-0, Ethyl methyl carbonate 628-28-4, n-Butylmethyl ether 646-06-0, 1,3-Dioxolane 1072-47-5 1850-14-2, Tetramethylorthocarbonate 3068-88-0, .beta.-Butyrolactone 6939-15-7, 3-Propylsydnone 56525-42-9, Methyl propyl carbonate
RL: DEV (Device component use); USES (Uses)
(compns. of ethylene carbonate based **electrolyte** solvent

mixts. for lithium batteries)
IT 21324-40-3, Lithium hexafluorophosphate 33454-82-9, Lithium trifluoromethanesulfonate
RL: DEV (Device component use); USES (Uses)
(compns. of ethylene carbonate based solvent mixts. for lithium salt **electrolytes** in lithium batteries)

L12 ANSWER 30 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 1993:680873 CAPLUS
DOCUMENT NUMBER: 119:280873
TITLE: Method for producing an intermetallic lithium compound
INVENTOR(S): Decornet, Philippe; Froment, Luc; Van Lierde, Andre; De Nys, Thierry Stefaan Andre
PATENT ASSIGNEE(S): N.V. Union Miniere S.A., Belg.
SOURCE: PCT Int. Appl., 23 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: French
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9314246	A1	19930722	WO 1993-EP76	19930113
W: AU, BB, BG, BR, CA, FI, HU, JP, KP, KR, LK, MG, MN, MW, NO, NZ, PL, RO, RU, SD, UA, US				
RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG				
BE 1006650	A3	19941108	BE 1992-55	19920120
AU 9333500	A1	19930803	AU 1993-33500	19930113
PRIORITY APPLN. INFO.:			BE 1992-55	19920120
			WO 1993-EP76	19930113

AB A Li halide soln. is electrolyzed in an org. solvent between an insol. anode and a cathode made of a material which is capable of forming an intermetallic compd. with Li. The used **electrolyte** is regenerated by means of the halogen produced at the anode as the halide source, and a low-cost lithium compd. such as Li2CO3 or Li waste as the Li ion source.
IT Aluminum alloy, base
RL: PRP (Properties)
(cathode, for prodn. of intermetallic lithium compds.)
IT 7429-90-5, Aluminum, uses
RL: USES (Uses)
(cathode, for prodn. of intermetallic lithium compds.)
IT 7704-34-9, Sulfur, uses 7726-95-6, Bromine, uses 7783-06-4, Hydrogen sulfide, uses
RL: USES (Uses)
(in electrochem. prodn. of intermetallic lithium compds.)
IT 12057-24-8, Lithium oxide, uses
RL: USES (Uses)

(in regeneration of used **electrolyte** from prodn. of intermetallic lithium compds.)

IT 554-13-2, Lithium carbonate 1310-65-2, Lithium hydroxide
RL: PRP (Properties)
(in regeneration of used **electrolyte** from prodn. of intermetallic lithium compds.)

IT 7550-35-8, Lithium bromide 10377-51-2, Lithium iodide
RL: PRP (Properties)
(prodn. of intermetallic lithium compds. by electrolysis of solns. contg.)

IT 7439-93-2DP, Lithium, intermetallic compd.
RL: IMF (Industrial manufacture); PREP (Preparation)
(prodn. of, electrochem.)

IT 75-52-5, Nitromethane, uses 96-47-9, 2-Methyltetrahydrofuran **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 109-99-9, Tetrahydrofuran, uses **110-00-9**, Furan 110-71-4, Ethylene glycol dimethyl ether 111-96-6, Diethylene glycol dimethyl ether 142-68-7, Tetrahydropyran 143-24-8, Tetraethylene glycol dimethyl ether
RL: USES (Uses)
(solvent, in electrochem. prodn. of intermetallic lithium compds.)

IT 646-06-0, 1,3-Dioxolane
RL: PRP (Properties)
(solvent, in electrochem. prodn. of intermetallic lithium compds.)

L12 ANSWER 31 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 1993:452959 CAPLUS
DOCUMENT NUMBER: 119:52959
TITLE: Nonaqueous-**electrolyte** lithium battery
INVENTOR(S): Watanabe, Hiroshi; Yoshimura, Seiji; Takahashi, Masatoshi; Ooshita, Ryuji; Furukawa, Sanehiro
PATENT ASSIGNEE(S): Sanyo Electric Co, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 05074486	A2	19930326	JP 1991-230090	19910910
JP 3066126	B2	20000717		

PRIORITY APPLN. INFO.: JP 1991-230090 19910910

AB The batteries use a mixt. contg. a main solvent and a 2nd solvent, having similar structure to the main solvent but having unsatd. bond, for their **electrolyte**. A mixt. of ethylene carbonate, butylene carbonate, and MeOC2H4OMe contg. vinylene carbonate was used in example.

IT Battery **electrolytes**
(lithium salts, solvent mixts. for, unsatd. compds in)

IT **110-00-9**, Furan 497-23-4, 2(5H)-Furanone 872-36-6, Vinylene carbonate
RL: USES (Uses)
(**electrolyte** solvent mixts. contg., for lithium batteries)
IT **96-48-0**, .gamma.-Butyrolactone **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate 109-99-9, Tetrahydrofuran, uses 110-71-4, 1,2-Dimethoxyethane 4437-85-8, Butylene carbonate
RL: USES (Uses)
(**electrolyte** solvent mixts. contg., vinyl carbonate in, for lithium batteries)
IT 21324-40-3 33454-82-9, Trifluoromethanesulfonic acid lithium salt
RL: USES (Uses)
(**electrolyte**, solvent mixts. for, in lithium batteries)

L12 ANSWER 32 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 1991:453399 CAPLUS
DOCUMENT NUMBER: 115:53399
TITLE: Nonaqueous-**electrolyte** secondary batteries
INVENTOR(S): Takami, Norio; Ohsaki, Takahisa; Inada, Kuniaki; Kurisu, Norihito; Yamada, Shuji; Takabayashi, Junichi
PATENT ASSIGNEE(S): Toshiba Corp., Japan; Toshiba Battery Co., Ltd.
SOURCE: Eur. Pat. Appl., 13 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 398689	A2	19901122	EP 1990-305300	19900516
EP 398689	A3	19920527		
EP 398689	B1	19950816		
R: DE, FR, GB				
JP 03049165	A2	19910301	JP 1989-184245	19890717
JP 03074061	A2	19910328	JP 1989-215594	19890822
JP 3017756	B2	20000313		
JP 03078976	A2	19910404	JP 1989-215593	19890822
CA 2016777	AA	19901116	CA 1990-2016777	19900515
CA 2016777	C	19931012		
US 5079109	A	19920107	US 1990-523569	19900515
JP 03250565	A2	19911108	JP 1990-193840	19900724
JP 3128230	B2	20010129		

PRIORITY APPLN. INFO.: JP 1989-122604 A 19890516
JP 1989-215594 A 19890822
JP 1989-184245 A 19890717
JP 1989-215592 A 19890822
JP 1989-215593 A 19890822
JP 1990-2557 19900111

AB The batteries comprise a Li-contg. cathode housed in a case, a Li anode

arranged in the case so that a separator is sandwiched between the anode and cathode, and a nonaq. **electrolyte**. The **electrolyte** is prepd. by dissolving an electrolytic salt (e.g., LiPF6 or LiBF4) in a solvent mixt. comprising ethylene carbonate, 2-methyltetrahydrofuran, and .gtoreq.1 ester- and/or ether-based nonaq. solvents. Batteries using these **electrolyte** solvent mixts. have large capacity and long charge/discharge cycle life.

IT Esters, uses and miscellaneous
Ethers, uses and miscellaneous
RL: USES (Uses)
(**electrolyte** solvent contg. ethylene carbonate and methyltetrahydrofuran and, for lithium batteries)

IT Batteries, secondary
(lithium-manganese dioxide, nonaq. **electrolytes** for)

IT **96-48-0**, .gamma.-Butyrolactone 108-32-7, Propylene carbonate 109-99-9, Tetrahydrofuran, uses and miscellaneous 110-71-4, 1,2-Dimethoxyethane 126-33-0, Sulfolane **534-22-5**, 2-Methylfuran 616-38-6, Dimethyl carbonate 629-14-1 646-06-0, 1,3-Dioxolane 4437-85-8, Butylene carbonate 17081-21-9, 1,3-Dimethoxypropane
RL: USES (Uses)
(**electrolyte** solvent contg. ethylene carbonate and methyltetrahydrofuran and, for lithium batteries)

IT 96-47-9, 2-Methyltetrahydrofuran **96-49-1**, Ethylene carbonate
RL: USES (Uses)
(**electrolyte** solvent contg., esters and ethers in, for lithium batteries)

IT 14283-07-9 21324-40-3
RL: USES (Uses)
(**electrolyte**, solvent mixts. for, for secondary batteries)

L12 ANSWER 33 OF 33 CAPLUS COPYRIGHT 2003 ACS
ACCESSION NUMBER: 1990:462644 CAPLUS
DOCUMENT NUMBER: 113:62644
TITLE: Secondary nonaqueous-**electrolyte** batteries
INVENTOR(S): Watanabe, Hiroshi; Yoshimura, Seiji; Furukawa, Sanehiro
PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 02086074	A2	19900327	JP 1988-235816	19880920
JP 2735842	B2	19980402		

PRIORITY APPLN. INFO.: JP 1988-235816 19880920

AB MnO2-Li batteries use LiCF3SO3 **electrolyte** dissolved in a solvent mixt. contg. .gtoreq.2 high b.p. solvents. The mixt. can be .gtoreq.2 cyclic carbonate esters, e. g., ethylene, propylene, and/or butyl carbonates, or .gtoreq.1 of the esters and .gamma.-butyrolactone or sulfolane. These batteries have long cycle life.

IT Batteries, secondary
(manganese dioxide-lithium, cyclic carbonate-contg. solvents for lithium trimethanesulfonate **electrolyte** for)

IT **96-48-0**, .gamma.-Butyrolactone 110-71-4, 1,2-Dimethoxyethane
RL: USES (Uses)
(**electrolyte** solvents contg. cyclic carbonate and, for lithium trifluoromethanesulfonate, for batteries)

IT **96-49-1**, Ethylene carbonate 108-32-7, Propylene carbonate
110-02-1, Thiophene
RL: USES (Uses)
(**electrolyte** solvents contg., for lithium trifluoromethanesulfonate, for batteries)

IT 33454-82-9, Lithium trifluoromethanesulfonate
RL: USES (Uses)
(**electrolyte**, solvent mixts. contg cyclic carbonates for, in batteries)

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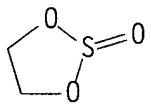
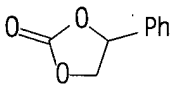
L1 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 3741-38-6 REGISTRY
CN 1,3,2-Dioxathiolane, 2-oxide (9CI) (CA INDEX NAME)
OTHER CA INDEX NAMES:
CN Ethylene glycol, cyclic sulfite (8CI)
CN **Ethylene sulfite (6CI)**
OTHER NAMES:
CN 1,2-Ethylene sulfite
CN Cyclic ethylene sulfite
CN Glycol sulfite
CN NSC 3225
FS 3D CONCORD
MF C2 H4 O3 S
CI COM
LC STN Files: AQUIRE, BEILSTEIN*, BIOSIS, CA, CAOLD, CAPLUS, CASREACT, CHEMCATS, CHEMLIST, CSCHEM, DETHERM*, GMELIN*, HODOC*, IFICDB, IFIPAT, IFIUDB, SPECINFO, TOXCENTER, USPATFULL, VTB
(*File contains numerically searchable property data)
Other Sources: EINECS**, NDSL**, TSCA**
(**Enter CHEMLIST File for up-to-date regulatory information)



PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

210 REFERENCES IN FILE CA (1957 TO DATE)
4 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA
210 REFERENCES IN FILE CAPLUS (1957 TO DATE)
31 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

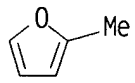
L2 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 4427-92-3 REGISTRY
CN 1,3-Dioxolan-2-one, 4-phenyl- (9CI) (CA INDEX NAME)
OTHER CA INDEX NAMES:
CN 1,2-Ethanediol, 1-phenyl-, cyclic carbonate (8CI)
CN Carbonic acid, cyclic phenylethylene ester (6CI, 7CI, 8CI)
OTHER NAMES:
CN 1-Phenyl-1,2-ethylene carbonate
CN 4-Phenyl-1,3-dioxolan-2-one
CN 4-Phenyldioxolan-2-one
CN Cyclic phenylethylene carbonate
CN **Phenylethylene carbonate**
FS 3D CONCORD
DR 129097-94-5, 16467-20-2
MF C9 H8 O3
CI COM
LC STN Files: BEILSTEIN*, CA, CAOLD, CAPLUS, CASREACT, CHEMINFORMRX, IFICDB, IFIPAT, IFIUDB, SPECINFO, TOXCENTER, USPAT2, USPATFULL
(*File contains numerically searchable property data)



PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

101 REFERENCES IN FILE CA (1957 TO DATE)
1 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA
101 REFERENCES IN FILE CAPLUS (1957 TO DATE)
10 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

L3 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 534-22-5 REGISTRY
CN Furan, 2-methyl- (8CI, 9CI) (CA INDEX NAME)
OTHER NAMES:
CN .alpha.-Methylfuran
CN **2-Methylfuran**
CN 5-Methylfuran
CN Silvan
CN Sylvan
FS 3D CONCORD
MF C5 H6 O
CI COM
LC STN Files: AGRICOLA, ANABSTR, AQUIRE, BEILSTEIN*, BIOBUSINESS, BIOSIS, CA, CAOLD, CAPLUS, CASREACT, CEN, CHEMCATS, CHEMINFORMRX, CHEMLIST, CHEMSAFE, CIN, CSCHEM, CSNB, DETHERM*, EMBASE, GMELIN*, HODOC*, IFICDB, IFIPAT, IFIUDB, MEDLINE, MSDS-OHS, NAPRALERT, NIOSHTIC, PIRA, PROMT, RTECS*, SPECINFO, TOXCENTER, USPAT2, USPATFULL, VTB
(*File contains numerically searchable property data)
Other Sources: DSL**, EINECS**, TSCA**
(**Enter CHEMLIST File for up-to-date regulatory information)



PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

1935 REFERENCES IN FILE CA (1957 TO DATE)
11 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA
1936 REFERENCES IN FILE CAPLUS (1957 TO DATE)
31 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

L4 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 110-00-9 REGISTRY
CN **Furan (7CI, 8CI, 9CI)** (CA INDEX NAME)
OTHER NAMES:
CN Divinylene oxide
CN Furfuran
CN Oxacyclopentadiene
CN Oxole
CN Tetrole
FS 3D CONCORD
MF C4 H4 O
CI COM, RPS
LC STN Files: ADISNEWS, AGRICOLA, ANABSTR, AQUIRE, BEILSTEIN*, BIOBUSINESS, BIOSIS, BIOTECHNO, CA, CANCERLIT, CAOLD, CAPLUS, CASREACT, CBNB, CEN, CHEMCATS, CHEMINFORMRX, CHEMLIST, CHEMSAFE, CIN, CSCHEM, CSNB, DETHERM*, DIPPR*, EMBASE, ENCOMPLIT, ENCOMPLIT2, ENCOMPPAT, ENCOMPPAT2, GMELIN*, HODOC*, HSDB*, IFICDB, IFIPAT, IFIUDB, IPA, MEDLINE, MRCK*, MSDS-OHS, NAPRALERT, NIOSHTIC, PDLCOM*, PIRA, PROMT, RTECS*, SPECINFO, SYNTHLINE, TOXCENTER, TULSA, ULIDAT, USPAT2, USPATFULL, VTB
(*File contains numerically searchable property data)
Other Sources: DSL**, EINECS**, TSCA**
(**Enter CHEMLIST File for up-to-date regulatory information)

PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

8324 REFERENCES IN FILE CA (1957 TO DATE)
1582 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA
8339 REFERENCES IN FILE CAPLUS (1957 TO DATE)
1 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

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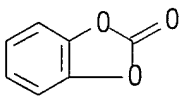
L5 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 110-02-1 REGISTRY
CN **Thiophene (8CI, 9CI)** (CA INDEX NAME)
OTHER NAMES:
CN CP 34
CN Divinylene sulfide
CN Furan, thio-
CN Huile H50
CN Huile HSO
CN Thiacyclopentadiene
CN Thiaphene
CN Thiofuran
CN Thiofurfuran
CN Thiole
CN Thiophen
CN Thiotetrole
FS 3D CONCORD
DR 8014-23-1
MF C4 H4 S
CI COM, RPS
LC STN Files: ADISNEWS, AGRICOLA, ANABSTR, AQUIRE, BEILSTEIN*, BIOBUSINESS, BIOSIS, BIOTECHNO, CA, CABA, CAOLD, CAPLUS, CASREACT, CBNB, CEN, CHEMCATS, CHEMINFORMRX, CHEMLIST, CHEMSAFE, CIN, CSCHEM, CSNB, DETHERM*, DIPPR*, EMBASE, ENCOMPLIT, ENCOMPLIT2, ENCOMPPAT, ENCOMPPAT2, GMELIN*, HODOC*, HSDB*, IFICDB, IFIPAT, IFIUDB, IPA, MRCK*, MSDS-OHS, NAPRALERT, NIOSHTIC, PDLCOM*, PIRA, PROMT, RTECS*, SPECINFO, SYNTHLINE, TOXCENTER, TULSA, ULIDAT, USPAT2, USPATFULL, VTB
(*File contains numerically searchable property data)
Other Sources: DSL**, EINECS**, TSCA**
(**Enter CHEMLIST File for up-to-date regulatory information)

PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

9923 REFERENCES IN FILE CA (1957 TO DATE)
1321 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA
9944 REFERENCES IN FILE CAPLUS (1957 TO DATE)
4 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

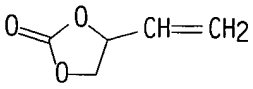
L6 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 2171-74-6 ° REGISTRY
CN 1,3-Benzodioxol-2-one (9CI) (CA INDEX NAME)
OTHER CA INDEX NAMES:
CN Carbonic acid, cyclic o-phenylene ester (7CI, 8CI)
CN Carbonic acid, o-phenylene ester (6CI)
OTHER NAMES:
CN **Catechol cyclic carbonate**
CN o-Phenylene carbonate
CN Pyrocatechol carbonate
FS 3D CONCORD
MF C7 H4 O3
CI COM
LC STN Files: BEILSTEIN*, CA, CAOLD, CAPLUS, CASREACT, CHEMCATS, CHEMINFORMRX, CHEMLIST, HODOC*, IFICDB, IFIPAT, IFIUDB, SPECINFO, TOXCENTER, USPATFULL
(*File contains numerically searchable property data)
Other Sources: EINECS**, NDSL**, TSCA**
(**Enter CHEMLIST File for up-to-date regulatory information)



PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

82 REFERENCES IN FILE CA (1957 TO DATE)
83 REFERENCES IN FILE CAPLUS (1957 TO DATE)
4 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

L7 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 4427-96-7 REGISTRY
CN 1,3-Dioxolan-2-one, 4-ethenyl- (9CI) (CA INDEX NAME)
OTHER CA INDEX NAMES:
CN Carbonic acid, cyclic vinylethylene ester (6CI, 7CI, 8CI)
OTHER NAMES:
CN 4-Ethenyl-1,3-dioxolan-2-one
CN 4-Vinyl-1,3-dioxolan-2-one
CN **Vinylethylene carbonate**
FS 3D CONCORD
DR 140237-51-0
MF C5 H6 O3
CI COM
LC STN Files: BEILSTEIN*, CA, CAOLD, CAPLUS, CASREACT, CHEMCATS, CHEMLIST, DETHERM*, USPAT2, USPATFULL
(*File contains numerically searchable property data)



PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

61 REFERENCES IN FILE CA (1957 TO DATE)
62 REFERENCES IN FILE CAPLUS (1957 TO DATE)
3 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

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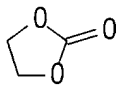
L8 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 96-49-1 REGISTRY
CN 1,3-Dioxolan-2-one (9CI) (CA INDEX NAME)
OTHER CA INDEX NAMES:
CN Carbonic acid, cyclic ethylene ester (6CI, 8CI)
OTHER NAMES:
CN Cyclic ethylene carbonate
CN **Ethylene carbonate**
CN Ethylene glycol carbonate
CN Glycol carbonate
CN Jeffsol EC
CN Texacar EC
FS 3D CONCORD
MF C3 H4 O3
CI COM
LC STN Files: AGRICOLA, ANABSTR, AQUIRE, BEILSTEIN*, BIOBUSINESS, BIOSIS, BIOTECHNO, CA, CANCERLIT, CAOLD, CAPLUS, CASREACT, CBNB, CEN, CHEMCATS, CHEMINFORMRX, CHEMLIST, CHEMSAFE, CIN, CSCHEM, CSNB, DETHERM*, DIPPR*, EMBASE, ENCOMPLIT, ENCOMPLIT2, ENCOMPPAT, ENCOMPPAT2, GMELIN*, HODOC*, HSDB*, IFICDB, IFIPAT, IFIUDB, MEDLINE, MSDS-OHS, NIOSHTIC, PDLCOM*, PIRA, PROMT, RTECS*, SPECINFO, SYNTHLINE, TOXCENTER, TULSA, USPAT2, USPATFULL, VTB
(*File contains numerically searchable property data)
Other Sources: DSL**, EINECS**, TSCA**
(**Enter CHEMLIST File for up-to-date regulatory information)



PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

6022 REFERENCES IN FILE CA (1957 TO DATE)
176 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA
6049 REFERENCES IN FILE CAPLUS (1957 TO DATE)
141 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

L9 ANSWER 1 OF 1 REGISTRY COPYRIGHT 2003 ACS
RN 96-48-0 REGISTRY
CN 2(3H)-Furanone, dihydro- (8CI, 9CI) (CA INDEX NAME)
OTHER NAMES:
CN .gamma.-BL
CN .gamma.-Butalactone
CN **.gamma.-Butyrolactone**
CN .gamma.-Butyryllactone
CN .gamma.-Hydroxybutyric acid lactone
CN 1,4-Butanolide
CN 1-Oxacyclopentan-2-one
CN 2,3,4,5-Tetrahydro-2-furanone
CN 2-Oxolanone
CN 2-Oxotetrahydrofuran
CN 4,5-Dihydro-2(3H)-furanone
CN 4-Butanolide
CN 4-Deoxytetronic acid
CN 4-Hydroxybutanoic acid lactone
CN 4-Hydroxybutyric acid lactone
CN Butanoic acid, 4-hydroxy-, .gamma.-lactone
CN Butyric acid lactone
CN Butyrolactone
CN Dihydro-2(3H)-furanone
CN NIH 10540
CN Paint Clean G
CN Tetrahydro-2-furanone
FS 3D CONCORD
DR 187997-16-6
MF C4 H6 O2
CI COM
LC STN Files: ADISINSIGHT, ADISNEWS, AGRICOLA, ANABSTR, AQUIRE, BEILSTEIN*, BIOBUSINESS, BIOSIS, BIOTECHNO, CA, CANCERLIT, CAOLD, CAPLUS, CASREACT, CBNB, CEN, CHEMCATS, CHEMINFORMRX, CHEMLIST, CHEMSAFE, CIN, CSCHEM, CSNB, DDFU, DETHERM*, DIOGENES, DIPPR*, DRUGU, EMBASE, ENCOMPLIT, ENCOMPLIT2, ENCOMPPAT, ENCOMPPAT2, GMELIN*, HODOC*, HSDB*, IFICDB, IFIPAT, IFIUDB, IPA, MEDLINE, MRCK*, MSDS-OHS, NAPRALERT, NIOSHTIC, PDLCOM*, PIRA, PROMT, RTECS*, SPECINFO, SYNTHLINE, TOXCENTER, TULSA, ULIDAT, USPAT2, USPATFULL, VTB
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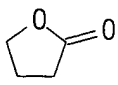

PROPERTY DATA AVAILABLE IN THE 'PROP' FORMAT

7356 REFERENCES IN FILE CA (1957 TO DATE)
206 REFERENCES TO NON-SPECIFIC DERIVATIVES IN FILE CA
7367 REFERENCES IN FILE CAPLUS (1957 TO DATE)
37 REFERENCES IN FILE CAOLD (PRIOR TO 1967)

PATENT ABSTRACTS OF JAPAN

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(54) LITHIUM BATTERY

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a lithium battery by which reduction in battery capacity by self-discharge is hardly caused and which is excellent in a preserving characteristic.

SOLUTION: A lithium battery is formed by using lithium as a negative electrode active material, a manganese oxide as a positive electrode active material and a nonaqueous solvent as a solvent of electrolyte. At least an ethylene carbonate is used as a solvent of the electrolyte, and a material by combining one kind or plural kinds of chain monoether, chain triether, chain tetraether, ring ether, chain cabonic ester, lactone, 3-propyl sydnone and benzene, is added by 1 to 20 volume % as an additional solvent. Trifluoromethane sulfonic acid lithium LiCF3SO3 or hexafluorophosphric acid lithium LiPF6 is used as a salute in the electrolyte.

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* NOTICES *

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] While using a lithium for a negative-electrode active material and using a manganic acid ghost for a positive active material In the lithium cell which used the non-drainage system solvent for the solvent of the electrolytic solution, while using ethylene carbonate for the solvent of the above-mentioned electrolytic solution at least 1-20 volume % addition of one sort or the thing combined two or more sorts of the chain-like monochrome ether, chain-like triether, the chain-like tetrapod ether, cyclic ether, a chain-like carbonate, lactone, 3-propyl sydnone, and benzene is done as an addition solvent. Moreover, it is trifluoromethane sulfonic-acid lithium LiCF3 SO3 to the solute in the above-mentioned electrolytic solution. Or hexafluoro phosphoric-acid lithium LiPF6 Lithium cell characterized by using.
[Claim 2] The lithium cell characterized by adding the solvent which combined any one sort of 1 and 2-dimethoxyethane, propylene carbonate, and butylene carbonate, or two or more sorts other than the above-mentioned ethylene carbonate and the above-mentioned addition solvent as a solvent of the aforementioned electrolytic solution in the lithium cell indicated to the claim 1.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention uses a lithium for a negative-electrode active material, and uses a manganic acid ghost for a positive active material, the lithium cell which used the non-drainage system solvent for the solvent of the electrolytic solution is started, and self-discharge is especially related with the lithium cell which there were and was excellent in the preservation property. [few]
[0002]
[Description of the Prior Art] From the former, it is manganese dioxide MnO2 to a positive active material about a lithium in a negative-electrode active material. It uses. The lithium cell which used the non-drainage system solvent for the solvent of the electrolytic solution is known. as such a lithium cell From the point which oxidizes the front face of the lithium used for a negative electrode, and forms the stable thin protective coating of ion conductivity, as a solvent of the electrolytic solution generally non-proton nature organic solvents, such as ethylene carbonate and propylene carbonate, use it -- having -- moreover -- as the solute of the electrolytic solution -- hoe lithium fluoride LiBF4 Lithium perchlorate LiClO4 etc. -- it was used
[0003] However, in the conventional lithium cell, manganese dioxide used for the positive electrode reacted gradually with the above-mentioned electrolytic solution, and decomposed, the so-called self-discharge arose, and when saved for a long time, there was a problem that cell capacity fell greatly.
[0004]
[Problem(s) to be Solved by the Invention] This invention makes it a technical problem to solve the above problems in a lithium cell, when a manganic acid ghost is especially used for a positive active material, it lessens that this manganic acid ghost reacts with the electrolytic solution as mentioned above, and carries out self-discharge, and when saved for a long time, it aims at offering the lithium cell excellent in the preservation property which is not things that cell capacity decreases greatly.
[0005] Here, in order that this invention person etc. may suppress that the manganic acid ghost which is a positive active material reacts with the electrolytic solution, and carries out self-discharge, he repeats research about the material of the solvent used for the electrolytic solution, and a solute, and came to complete this invention.
[0006]
[Means for Solving the Problem] In order to solve the above technical problems in this invention, while using a lithium for a negative-electrode active material and using a manganic acid ghost for a positive active material In the lithium cell which used the non-drainage system solvent for the solvent of the electrolytic solution, while using ethylene carbonate for the solvent of the above-mentioned electrolytic solution at least 1-20 volume % addition of one sort or the thing combined two or more sorts of the chain-like monochrome ether, chain-like triether, the chain-like tetrapod ether, cyclic ether, a chain-like carbonate, lactone, 3-propyl sydnone, and benzene is done as an addition solvent. Moreover, it is trifluoromethane sulfonic-acid lithium LiCF3 SO3 to the solute in the above-mentioned electrolytic

invention is not limited to what was shown in the following example, and can be suitably changed in the range which does not change the summary.
[0014] (Examples 1-5 and examples 1-5 of comparison) It was made to make only the kind of electrolytic solution used for a lithium cell change in these examples and the example of comparison.
[0015] the carbon which is this manganese dioxide and an electric conduction agent using the manganese dioxide powder calcinated at 375 degrees C as a [production of positive electrode] positive active material, and the polytetrafluoroethylene which is a binder -- MnO2 : carbon: -- the weight ratio of binder =80:10:10 -- mixing -- a positive electrode -- the mixture was obtained and this positive electrode -- pressurization molding of the mixture was carried out and the disk-like positive electrode was produced In addition, the stainless steel network (SUS304) was used as a positive-electrode charge collector.
[0016] The negative electrode which pierces [production of negative electrode] lithium rolled plate, and consists of a metal lithium board of a circle configuration was produced, and the negative-electrode charge collector was attached in this negative electrode. In addition, the stainless steel network (SUS304) was used as this negative-electrode charge collector.
[0017] [Manufacture which is the electrolytic solution] In the example and the example of comparison of these While making it mix by the volume ratio which shows ethylene carbonate (EC), 1 and 2-dimethoxyethane (DME), and the gamma-butyrolactone (gamma-BL) of the addition solvent shown by this invention in the following table 1 as a solvent in the electrolytic solution It is trifluoromethane sulfonic-acid lithium LiCF3 SO3 shown in this invention as the solute. As it was used and the concentration of this solute became 1 mol/l, respectively, each electrolytic solution was prepared.
[0018] In producing each lithium cell of [production of a lithium cell], examples 1-5, and the examples 1-5 of comparison, the coin type lithium cell which became 2.5mm in the diameter of 20mm and thickness using the positive electrode, the negative electrode, and each electrolytic solution which were produced as mentioned above, respectively was produced.
[0019] It is made to hold in this lithium cell here in the cell case 4 which positive-electrode can 4a and negative-electrode can 4b form through the separator 3 into which each electrolytic solution was infiltrated between the positive electrodes 1 and negative electrodes 2 which were produced as mentioned above as shown in drawing 1 . While connecting a positive electrode 1 to positive-electrode can 4a through the positive-electrode charge collector 5, a negative electrode 2 is connected to negative-electrode can 4b through the negative-electrode charge collector 6. This positive-electrode can 4a and negative-electrode can 4b are electrically insulated with the insulating packing 7, and the chemical energy produced inside this cell is taken out from the ends child of positive-electrode can 4a and negative-electrode can 4b to the exterior as electrical energy.
[0020] The service capacity Q0 immediately after producing a cell, respectively about each lithium cell of [measurement of the rate of self-discharge] next the examples 1-5 produced as mentioned above, and the examples 1-5 of comparison and the service capacity Q1 after saving the produced cell for two months at 80 degrees C were measured, by the following formula, it asked for the rate of self-discharge in each lithium cell, and the result was shown according to the following table 1.
Rate of self-discharge (%) =100x (1-Q1/Q0)
[0021]
[Table 1]

solution. Or hexafluoro phosphoric-acid lithium LiPF6 It uses.
[0007] Having used ethylene carbonate at least as a solvent in the electrolytic solution here The front face of the alloy which carries out occlusion discharge of the metal lithium used for a negative electrode by this ethylene carbonate or the lithium oxidizes. In order to be because the stable thin protective coating of ion conductivity is formed in these front faces and the self-discharge in a negative electrode is suppressed by this and to suppress the self-discharge in a negative electrode further, It is more desirable to make the solvent which combined any one sort of 1 and 2-dimethoxyethane, propylene carbonate, and butylene carbonate or two or more sorts other than this ethylene carbonate add.
[0008] In addition, the metallic oxide and carbon material other than the alloy which carries out occlusion discharge of the above-mentioned metal lithium and the lithium ion as a negative electrode which makes a lithium an active material are used. A lithium ion and as occlusion and an alloy to emit For example, lithium alloys, such as Li-aluminum, Li-In, Li-Sn, Li-Pb, Li-Bi, Li-Ga, Li-Sr, Li-Si, Li-Zn, Li-Cd, Li-calcium, and Li-Ba as a metallic oxide -- Fe 2O3, TiO2, Nb 2O3, and WO3 etc. -- as a carbon material, a natural graphite, an artificial graphite, amorphous carbon, etc. can be used, for example
[0009] Moreover, the solvent using ethylene carbonate is received. While making one sort or the thing combined two or more sorts of the chain-like monochrome ether, chain-like triether, the chain-like tetrapod ether, cyclic ether, a chain-like carbonate, lactone, 3-propyl sydnone, and benzene add as an addition solvent as mentioned above The trifluoromethane sulfonic-acid lithium or the hexafluoro phosphoric-acid lithium was used as a solute, because the reaction of the electrolytic solution to the manganic acid ghost which is a positive active material was suppressed by the synergism of ethylene carbonate, these addition solvents, and a solute. In addition, although it is not clear about these synergisms, according to experiential learning, such as this invention person, the stable protective coating of ion conductivity is formed in the front face of a manganic acid ghost of ethylene carbonate, an above-mentioned addition solvent, and an above-mentioned solute, and it is thought that a reaction with the electrolytic solution is suppressed by this.
[0010] Moreover, the amount of the above-mentioned addition solvent was made into 1 - 20 volume % for the property of a lithium cell falling with these addition solvents, when the amount increased more than 20 volume %, while fully being unable to suppress the reaction of the electrolytic solution to a manganic acid ghost but becoming easy to produce self-discharge, if there are few the amounts than 1 volume %.
[0011] As the chain-like monochrome ether used as the above-mentioned addition solvent here Diethylether, n-butyl methyl ether, an isopropyl ether, a methylphenyl ether, etc. for example, as; chain-like triether A diethylene-glycol wood ether, diethylene-glycol diethylether, trimethoxy methane, TORIETOKISHI methane, etc. for example, as the; chain-like tetrapod ether Tetramethyl ortho carbonate, 1, 1 and 3, 3-tetrapod ethoxy propane, etc. for example, as; cyclic ether For example, a tetrahydrofuran, 2-methyl tetrahydrofuran, a furan, 2-methyl furan, a dioxolane, 2-methyl dioxolane, 4-methyl dioxolane, etc. as a; chain-like carbonate For example, a dimethyl carbonate, an ethyl-carbonate methyl, diethyl carbonate, carbonic acid methylpropyl, etc. can be used, for example for gamma-butyrolactone, gamma-valerolactone, beta-butyrolactone, beta-PUROPIRO lactone, delta-valerolactone, etc. as; lactone.
[0012]
[Function] In the lithium cell in this invention, while using ethylene carbonate at least as a solvent in the electrolytic solution Addition solvents, such as the aforementioned chain-like monochrome ether, 1-20 volume % addition Since it carried out and the trifluoromethane sulfonic-acid lithium or the hexafluoro phosphoric-acid lithium was further used for the solute, The reaction of the electrolytic solution to a manganic acid ghost is suppressed by these synergisms as mentioned above, and when self-discharge stops being able to happen easily and being saved for a long time, the fall of cell capacity decreases.
[0013]
[Example] While giving an example and explaining the lithium cell of this invention concretely hereafter, the example of comparison is given and it is shown clearly that the self-discharge in the lithium cell concerning the example of this invention decreases. In addition, the lithium cell in this

	溶媒体積比			自己放電率 %
	EC	DME	γ－BL	
実施例1	90	0	10	5
実施例2	49．5	49．5	1	5
実施例3	47．5	47．5	5	5
実施例4	45	45	10	4
実施例5	40	40	20	5
比較例1	100	0	0	25
比較例2	50	50	0	19
比較例3	49．95	49．95	0．1	18
比較例4	49．75	49．75	0．5	16
比較例5	35	35	30	15
*溶質 $LiCF_3SO_3$				

[0022] It is LiCF3 SO3 to the solute of the electrolytic solution so that clearly from this result. While using, each lithium cell of the examples 1-5 which added the gamma-butyrolactone which is an addition solvent together with ethylene carbonate as the solvent in the range of 1 - 20 volume % did not add gamma-butyrolactone, there were too few the amounts, and the rate of self-discharge was very low compared with each lithium cell of the examples 1-5 of comparison which are.
[0023] In these examples of comparison (Examples 6-9 of comparison) It is made not to use ethylene carbonate for the solvent in the electrolytic solution. as the solvent It is made to mix propylene carbonate (PC), butylene carbonate (BC), and Above DME and gamma-BL by the volume ratio shown in the following table 2. about except [it] While producing each lithium cell like the above-mentioned case, it asked for the rate of self-discharge of each lithium cell, and the result was shown according to Table 2.
[0024]
[Table 2]

	溶媒体積比	自己放電率 %
比較例6	PC：DME：γ－BL＝50：50：0	16
比較例7	PC：DME：γ－BL＝45：45：10	15
比較例8	BC：DME：γ－BL＝50：50：0	14
比較例9	BC：DME：γ－BL＝45：45：10	14
溶質 $LiCF_3SO_3$		

[0025] It sets to the lithium cell of the examples 6-9 of comparison which did not use ethylene carbonate ethylene for the solvent in the electrolytic solution so that clearly from this result, and is LiCF3 SO3 to the solute of the electrolytic solution. While using, even if it 10 volume % Was the case where it added, compared with the lithium cell of each above-mentioned example, the rate of self-discharge was very high about gamma-butyrolactone.

[0026] In the thing of these examples and the example of comparison (An example 6 and examples 10-14 of comparison) While making it mix EC, PC, above-mentioned BC and DME, and above-mentioned gamma-BL by the volume ratio shown in the following table 3 as a solvent of the electrolytic solution aforementioned LiCF3 SO3 as a solute of the electrolytic solution Hexafluoro phosphoric-acid lithium LiPF6 which was changed and was shown in this invention It is made to use and alike other than this therefore As it was the above, while producing each lithium cell, it asked for the rate of self-discharge of each lithium cell, and the result was shown according to Table 3.

[0027]

[Table 3]

	溶媒体積比	自己放電率 %
実施例6	EC：DME：γ－BL＝45：45：10	4
比較例10	EC：DME：γ－BL＝50：50： 0	21
比較例11	PC：DME：γ－BL＝50：50： 0	18
比較例12	PC：DME：γ－BL＝45：45：10	17
比較例13	BC：DME：γ－BL＝50：50： 0	16
比較例14	BC：DME：γ－BL＝45：45：10	15
＊溶質 $LiPF_6$		

[0028] Consequently, LiPF6 shown in the solute of the electrolytic solution by this invention When it uses, it is LiCF3 SO3 to a solute. Like the case where it uses, as a solvent of the electrolytic solution The lithium cell of the example 6 which added gamma-butyrolactone in the range of 1 - 20 volume % together with ethylene carbonate Gamma-butyrolactone was not added to a solvent and the rate of self-discharge was very low compared with each lithium cell of the examples 10-14 of comparison which did not use ethylene carbonate.

[0029] In these examples of comparison (Examples 15-18 of comparison) While making the solvent of the electrolytic solution mix EC, above-mentioned DME, and above-mentioned gamma-BL by the volume ratio shown in the following table 4 They are above-mentioned LiCF3 SO3 shown by this invention as the solute, and LiPF6. The solute of an except is used. the examples 15 and 16 of comparison -- setting -- a solute -- LiBF4 the examples 17 and 18 of comparison -- setting -- a solute -- LiAlCl4 It is made to use and alike other than this therefore As it was the above, while producing each lithium cell, it asked for the rate of self-discharge of each lithium cell, and the result was shown according to Table 4.

[0030]

[Table 4]

	溶媒体積比	溶質	自己放電率%
比較例15	EC：DME ：γ－BL=50：50： 0	$LiBF_4$	21
比較例16	EC：DME ：γ－BL=45：45：10	$LiBF_4$	22
比較例17	EC：DME ：γ－BL=50：50： 0	$LiAlCl_4$	22
比較例18	EC：DME ：γ－BL=45：45：10	$LiAlCl_4$	24

[0031] LiCF3 SO3 shown in the solute of the electrolytic solution by this invention so that clearly from this result LiPF6 LiBF4 of an except LiAlCl4 When what added gamma-butyrolactone to the solvent of the electrolytic solution in the range of 1 - 20 volume % together with ethylene carbonate when it used was used, the rate of self-discharge was very high compared with the thing of an example.
[0032] In the thing of these examples and the example of comparison (Examples 7 and 8 and examples 19-22 of comparison) While using EC, above-mentioned PC and DME, and above-mentioned gamma-BL for the solvent of the electrolytic solution by the volume ratio shown in the following table 5 As a solute, it is above-mentioned LiCF3 SO3. By making it use and other than this being alike therefore, as it was the above, while producing each lithium cell, it asked for the rate of self-discharge in each lithium cell, and the result was shown according to Table 5.
[0033]
[Table 5]

	溶媒体積比	自己放電率 %
実施例7	EC：PC：DME ：γ－BL＝30：30：30：10	2
実施例8	EC：BC：DME ：γ－BL＝30：30：30：10	1
比較例19	EC：PC：DME ：γ－BL＝33：33：33： 0	14
比較例20	EC：BC：DME ：γ－BL＝33：33：33： 0	13
比較例21	PC：BC：DME ：γ－BL＝33：33：33： 0	13
比較例22	PC：BC：DME ：γ－BL＝30：30：30：10	13
＊溶質 $LiCF_3SO_3$		

[0034] Gamma-butyrolactone is added in the range of 1 - 20 volume % together with ethylene carbonate as a solvent in the electrolytic solution so that clearly from this result. Or it sets to the lithium cell of the examples 7 and 8 which added 1 and 2-dimethoxyethane and butylene carbonate. further 1, 2-dimethoxyethane, and propylene carbonate -- When the rate of self-discharge is still lower than the lithium cell in each aforementioned example and these mixed solvents were used, it became clear that it is more effective.
[0035] On the other hand, in each lithium cell of the examples 19-22 of comparison which contain neither gamma-butyrolactone nor ethylene carbonate, the rate of self-discharge was high compared with the thing of each example.
[0036] In these examples (Examples 9-35) While using above-mentioned EC and above-mentioned DME for the solvent in the electrolytic solution, the kind of addition solvent which this is made to add instead of aforementioned gamma-BL The lactone shown in following Table 6 - 8 which is other addition solvents shown in this invention, the chain-like monochrome ether, chain-like triether, the chain-like tetrapod ether, cyclic ether, a chain-like carbonate, 3-propyl sydnone, and benzene are mixed by the volume ratio shown in this **, respectively. Moreover, as a solute, it is aforementioned LiCF3 SO3. By using it and other than this being alike therefore, as it was the above, while producing each lithium cell, it asked for the rate of self-discharge of each lithium cell, and the result was shown according to Table 6 - 8.
[0037]
[Table 6]

	溶媒体積比	自己放電率 %
実施例9	EC：DME ：γ－バレロラクトン =45：45：10	5
実施例10	EC：DME ：β－プチロラクトン =45：45：10	4
実施例11	EC：DME ：β－プロピロラクトン=45：45：10	4
実施例12	EC：DME ：δ－バレロラクトン =45：45：10	4
*溶質 $LiCF_3SO_3$		

[0038]
[Table 7]

	溶媒体積比	自己放電率
実施例13	EC：DME ：ジエチルエーテル =45：45：10	5 %
実施例14	EC：DME ：n－ブチルメチルエーテル=45：45：10	5 %
実施例15	EC：DME ：イソプロピルエーテル =45：45：10	5 %
実施例16	EC：DME ：メチルフェニルエーテル =45：45：10	4 %
実施例17	EC：DME ：ジエチレングリコールジメチルエーテル =45：45：10	4 %
実施例18	EC：DME ：ジエチレングリコールジエチルエーテル =45：45：10	5 %
実施例19	EC：DME ：トリメトキシメタン =45：45：10	4 %
実施例20	EC：DME ：トリエトキシメタン =45：45：10	4 %
実施例21	EC：DME ：テトラメチルオルトカーボネート =45：45：10	5 %
実施例22	EC：DME ：1,1,3,3-テトラエトキシプロパン =45：45：10	5 %
実施例23	EC：DME ：テトラヒドロフラン =45：45：10	4 %
実施例24	EC：DME ：2-メチルテトラヒドロフラン =45：45：10	3 %
実施例25	EC：DME ：フラン =45：45：10	5 %
実施例26	EC：DME ：２－メチルフラン =45：45：10	3 %
実施例27	EC：DME ：ジオキソラン =45：45：10	5 %
実施例28	EC：DME ：２－メチルジオキソラン =45：45：10	4 %
実施例29	EC：DME ：４－メチルジオキソラン =45：45：10	4 %
*溶質 $LiCF_3SO_3$		

[0039]
[Table 8]

	溶媒体積比	自己放電率 %
実施例30	EC：DME ：炭酸ジメチル =45：45：10	5
実施例31	EC：DME ：炭酸エチルメチル =45：45：10	5
実施例32	EC：DME ：炭酸ジエチル =45：45：10	5
実施例33	EC：DME ：炭酸メチルプロピル =45：45：10	5
実施例34	EC：DME ：３－プロピルシドノン=45：45：10	5
実施例35	EC：DME ：ベンゼン =45：45：10	5
*溶質 $LiCF_3SO_3$		

[0040] In these examples (Examples 36-37) While using above-mentioned EC and above-mentioned DME for the solvent in the electrolytic solution, as an addition solvent which this is made to add It is made to mix by the volume ratio which shows two kinds of addition solvents in this **, as shown in the following table 9, and is aforementioned LiCF3SO3 as a solute. It is used. about except [it] As it was the above, while producing each lithium cell, it asked for the rate of self-discharge of each lithium cell, and the result was shown according to Table 9.

[0041]

[Table 9]

	溶媒体積比	自己放電率 %
実施例36	EC：DME ：γ－BL：ジエチルエーテル =45：45： 5： 5	5
実施例37	EC：DME ：γ－BL：トリエトキシメタン =45：45： 5： 5	3
*溶質 $LiCF_3SO_3$		

[0042] Even if it was the case where two kinds were used combining the aforementioned addition solvent so that clearly from this result, in each lithium cell of the examples 36 and 37 which have these volume %s in the range of 10 - 30 volume %, the rate of self-discharge was falling remarkably like each above-mentioned example compared with the thing of each example of comparison.

[0043] (Examples 38-41 and examples 23-26 of comparison) While mixing EC, above-mentioned PC and above-mentioned DME, and gamma-BL by the volume ratio shown in the following table 10 as a solvent in the electrolytic solution in the thing of these examples and the example of comparison, as a solute, it is aforementioned LiCF3 SO3. ******. To moreover, the negative electrode in the above-mentioned lithium cell The Li-aluminum alloy which aluminum contained 1% of the weight in the lithium, the Li-Sn alloy which tin contained 1% of the weight in the lithium, the Li-In alloy which the indium contained 1% of the weight in the lithium, and the Li-Pb alloy which lead contained 1% of the weight in the lithium are used. By other than this being alike therefore, as it was the above, while producing each lithium cell, it asked for the rate of self-discharge of each lithium cell, and the result was

shown according to Table 10.
[0044]
[Table 10]

	負極材料	溶媒体積比				自己放電率 %
		EC	PC	DME	γ－BL	
実施例38	Li－Al	30	30	30	10	1
比較例23	Li－Al	33	33	33	0	12
実施例39	Li－Sn	30	30	30	10	1
比較例24	Li－Sn	33	33	33	0	13
実施例40	Li－In	30	30	30	10	1
比較例25	Li－In	33	33	33	0	13
実施例41	Li－Pb	30	30	30	10	2
比較例26	Li－Pb	33	33	33	0	13
＊溶質 $LiCF_3SO_3$						

[0045] Consequently, it also sets, when a lithium alloy is used for a negative electrode, and it is LiCF3 SO3 of the above [solute / of the electrolytic solution]. While using, as for each lithium cell of the examples 38-41 which added the gamma-butyrolactone which is an addition solvent together with ethylene carbonate to the solvent in the range of 1 - 20 volume %, compared with each lithium cell of the examples 23-26 of comparison which did not add gamma-butyrolactone, the rate of self-discharge had become very low.
[0046] In addition, although the example which used the metal lithium and the lithium alloy for the negative electrode was only shown in the above-mentioned example It is also possible to use for a negative electrode the metallic oxide which carries out occlusion discharge of the lithium ion, and a carbon material, and the almost same result as the thing of each above-mentioned example is obtained also in this case. as an addition solvent Even if it makes the combination change using the lactone except having been shown in each above-mentioned example, the chain-like monochrome ether, chain-like triether, the chain-like tetrapod ether, cyclic ether, and a chain-like carbonate, the almost same result is obtained.
[0047]
[Effect of the Invention] As explained in full detail above, while using ethylene carbonate at least as a solvent in the electrolytic solution in this invention in the lithium cell which used the manganic acid ghost for the positive active material Addition solvents, such as the aforementioned chain-like monochrome ether, 1-20 volume % addition Since it carried out and the trifluoromethane sulfonic-acid lithium or the hexafluoro phosphoric-acid lithium was further used for the solute, The self-discharge in a lithium cell is suppressed, when saved for a long time, reduction of cell capacity decreases, and a lithium cell with a sufficient preservation property came to be obtained.

[Translation done.]

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(54)【発明の名称】　リチウム電池

(57)【要約】

【課題】　自己放電による電池容量の減少が少ない保存特性に優れたリチウム電池を提供する。

【解決手段】　負極活物質にリチウムを、正極活物質にマンガン酸化物を用いると共に、電解液の溶媒に非水系溶媒を用いたリチウム電池において、上記電解液の溶媒に少なくともエチレンカーボネートを用いると共に、添加溶媒として鎖状モノエーテル，鎖状トリエーテル，鎖状テトラエーテル，環状エーテル，鎖状炭酸エステル，ラクトン，３－プロピルシドノン及びベンゼンの１種又は複数種組み合わせたものを１～２０体積％添加し、また上記電解液における溶質にトリフルオロメタンスルホン酸リチウムＬｉＣＦ$_3$ ＳＯ$_3$ 又はヘキサフルオロリン酸リチウムＬｉＰＦ$_6$ を用いるようにした。

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【特許請求の範囲】

【請求項1】　負極活物質にリチウムを、正極活物質にマンガン酸化物を用いると共に、電解液の溶媒に非水系溶媒を用いたリチウム電池において、上記電解液の溶媒に少なくともエチレンカーボネートを用いると共に、添加溶媒として鎖状モノエーテル，鎖状トリエーテル，鎖状テトラエーテル，環状エーテル，鎖状炭酸エステル，ラクトン，3－プロピルシドノン及びベンゼンの1種又は複数種組み合わせたものを1～20体積%添加し、また上記電解液における溶質にトリフルオロメタンスルホン酸リチウム$LiCF_3SO_3$又はヘキサフルオロリン酸リチウム$LiPF_6$を用いたことを特徴とするリチウム電池。

【請求項2】　請求項1に記載したリチウム電池において、前記電解液の溶媒として、上記のエチレンカーボネートと上記の添加溶媒の他に、1，2－ジメトキシエタンとプロピレンカーボネートとブチレンカーボネートの何れか1種又は複数種を組み合わせた溶媒を添加したことを特徴とするリチウム電池。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、負極活物質にリチウムを、正極活物質にマンガン酸化物を用い、電解液の溶媒に非水系溶媒を使用したリチウム電池に係り、特に、自己放電が少なくて保存特性に優れたリチウム電池に関するものである。

【0002】

【従来の技術】従来より、負極活物質にリチウムを、正極活物質に二酸化マンガンMnO_2を用い、電解液の溶媒に非水系溶媒を使用したリチウム電池が知られており、このようなリチウム電池としては、負極に使用するリチウムの表面を酸化して安定な薄いイオン導電性の保護被膜を形成する点から、電解液の溶媒として、一般にエチレンカーボネート，プロピレンカーボネート等の非プロトン性有機溶媒が使用され、また電解液の溶質としては、ホウフッ化リチウム$LiBF_4$や過塩素酸リチウム$LiClO_4$等が使用されていた。

【0003】しかし、従来のリチウム電池においては、正極に使用した二酸化マンガンが上記電解液と徐々に反応して分解し、いわゆる自己放電が生じ、長く保存した場合に電池容量が大きく低下するという問題があった。

【0004】

【発明が解決しようとする課題】この発明は、リチウム電池における上記のような問題を解決することを課題とするものであり、特に、正極活物質にマンガン酸化物を用いた場合において、このマンガン酸化物が上記のように電解液と反応して自己放電するということを少なくし、長く保存した場合に電池容量が大きく減少するということない保存特性に優れたリチウム電池を提供することを目的とするものである。

2

【0005】ここで、本発明者等は、正極活物質であるマンガン酸化物が電解液と反応して自己放電するのを抑制するため、その電解液に使用する溶媒及び溶質の材料について研究を重ね、この発明を完成するに至ったのである。

【0006】

【課題を解決するための手段】この発明においては、上記のような課題を解決するため、負極活物質にリチウムを、正極活物質にマンガン酸化物を用いると共に、電解液の溶媒に非水系溶媒を用いたリチウム電池において、上記電解液の溶媒に少なくともエチレンカーボネートを用いると共に、添加溶媒として鎖状モノエーテル，鎖状トリエーテル，鎖状テトラエーテル，環状エーテル，鎖状炭酸エステル，ラクトン，3－プロピルシドノン及びベンゼンの1種又は複数種組み合わせたものを1～20体積%添加し、また上記電解液における溶質にトリフルオロメタンスルホン酸リチウム$LiCF_3SO_3$又はヘキサフルオロリン酸リチウム$LiPF_6$を用いる。

【0007】ここで、電解液における溶媒として、少なくともエチレンカーボネートを用いたのは、このエチレンカーボネートにより負極に使用する金属リチウムやリチウムを吸蔵放出する合金の表面が酸化されて、これらの表面に安定な薄いイオン導電性の保護被膜が形成され、これにより負極における自己放電が抑制されるためであり、さらに負極における自己放電を抑制するため、このエチレンカーボネートの他に、1，2－ジメトキシエタンとプロピレンカーボネートとブチレンカーボネートの何れか1種又は複数種を組み合わせた溶媒を添加させることがより好ましい。

【0008】なお、リチウムを活物質とする負極としては、上記の金属リチウム、リチウムイオンを吸蔵放出する合金の他に、金属酸化物，炭素材料が使用される。そして、リチウムイオンを吸蔵及び放出する合金としては、例えばLi－Al，Li－In，Li－Sn，Li－Pb，Li－Bi，Li－Ga，Li－Sr，Li－Si，Li－Zn，Li－Cd，Li－Ca，Li－Ba等のリチウム合金を、金属酸化物としては、例えばFe_2O_3，TiO_2，Nb_2O_3，WO_3等を、炭素材料としては、例えば天然黒鉛，人工黒鉛，無定形炭素等を使用することができる。

【0009】また、エチレンカーボネートを用いた溶媒に対し、上記のように添加溶媒として鎖状モノエーテル，鎖状トリエーテル，鎖状テトラエーテル，環状エーテル，鎖状炭酸エステル，ラクトン，3－プロピルシドノン及びベンゼンの1種又は複数種組み合わせたものを添加させると共に、溶質としてトリフルオロメタンスルホン酸リチウム又はヘキサフルオロリン酸リチウムを用いるようにしたのは、エチレンカーボネートとこれらの添加溶媒と溶質との相乗作用によって正極活物質であるマンガン酸化物に対する電解液の反応が抑制されるため

である。なお、これらの相乗作用については明確ではないが、本発明者等の経験的知得によると、上記のエチレンカーボネートと添加溶媒と溶質とによってマンガン酸化物の表面に安定なイオン導電性の保護被膜が形成され、これにより電解液との反応が抑制されるものと考えられる。

【００１０】また、上記の添加溶媒の量を１～２０体積％にしたのは、その量が１体積％より少ないと、マンガン酸化物に対する電解液の反応を十分に抑制することができず、自己放電が生じやすくなる一方、その量が２０体積％より多くなると、これらの添加溶媒によりリチウム電池の特性が低下するためである。

【００１１】ここで、上記の添加溶媒として使用する鎖状モノエーテルとしては、例えばジエチルエーテル、ｎ－ブチルメチルエーテル、イソプロピルエーテル、メチルフェニルエーテル等を；鎖状トリエーテルとしては、例えばジエチレングリコールジメチルエーテル、ジエチレングリコールジエチルエーテル、トリメトキシメタン、トリエトキシメタン等を；鎖状テトラエーテルとしては、例えばテトラメチルオルトカーボネート、１，１，３，３－テトラエトキシプロパン等を；環状エーテルとしては、例えばテトラヒドロフラン、２－メチルテトラヒドロフラン、フラン、２－メチルフラン、ジオキソラン、２－メチルジオキソラン、４－メチルジオキソラン等を；鎖状炭酸エステルとしては、例えば炭酸ジメチル、炭酸エチルメチル、炭酸ジエチル、炭酸メチルプロピル等を；ラクトンとしては、例えばγ－ブチロラクトン、γ－バレロラクトン、β－ブチロラクトン、β－プロピロラクトン，δ－バレロラクトン等を使用することができる。

【００１２】

【作用】この発明におけるリチウム電池においては、電解液における溶媒として少なくともエチレンカーボネートを用いると共に、前記の鎖状モノエーテル等の添加溶媒を１～２０体積％添加させ、さらに溶質にトリフルオロメタンスルホン酸リチウム又はヘキサフルオロリン酸リチウムを使用したため、上記のようにこれらの相乗作用によりマンガン酸化物に対する電解液の反応が抑制されて、自己放電が起こりにくくなり、長く保存した場合にも電池容量の低下が少なくなる。

【００１３】

【実施例】以下、この発明のリチウム電池について実施例を挙げて具体的に説明すると共に、比較例を挙げ、この発明の実施例に係るリチウム電池における自己放電が少なくなることを明らかにする。なお、この発明におけるリチウム電池は、下記の実施例に示したものに限定されるものではなく、その要旨を変更しない範囲において適宜変更できるものである。

【００１４】（実施例１～５及び比較例１～５）これらの実施例及び比較例においては、リチウム電池に使用する電解液の種類だけを変更させるようにした。

【００１５】［正極の作製］正極活物質として３７５℃で焼成した二酸化マンガン粉末を用い、この二酸化マンガンと導電剤であるカーボンと結着剤であるポリテトラフルオロエチレンとを、MnO_2 ：カーボン：結着剤＝８０：１０：１０の重量比で混合して正極合剤を得た。そして、この正極合剤を加圧成型して円盤状の正極を作製した。なお、正極集電体としてはステンレス網（ＳＵＳ３０４）を使用した。

【００１６】［負極の作製］リチウム圧延板を打ち抜いて円形状の金属リチウム板からなる負極を作製し、この負極に負極集電体を取り付けた。なお、この負極集電体としてはステンレス網（ＳＵＳ３０４）を使用した。

【００１７】［電解液の調製］これらの実施例及び比較例においては、電解液における溶媒として、エチレンカーボネート（ＥＣ）と、１，２－ジメトキシエタン（ＤＭＥ）と、本発明で示した添加溶媒のγ－ブチロラクトン（γ－ＢＬ）とを下記の表１に示す体積比で混合させると共に、その溶質としては、本発明において示したトリフルオロメタンスルホン酸リチウム$LiCF_3SO_3$を使用し、この溶質の濃度がそれぞれ１ｍｏｌ／ｌになるようにして各電解液を調製した。

【００１８】［リチウム電池の作製］そして、実施例１～５及び比較例１～５の各リチウム電池を作製するにあたっては、上記のようにして作製した正極と負極と各電解液とを用いてそれぞれ直径２０ｍｍ，厚さ２．５ｍｍになったコイン型のリチウム電池を作製するようにした。

【００１９】ここで、このリチウム電池においては、図１に示すように、上記のようにして作製した正極１と負極２の間に各電解液を含浸させたセパレータ３を介して正極缶４ａと負極缶４ｂが形成する電池ケース４内に収容させ、正極集電体５を介して正極１を正極缶４ａに接続させる一方、負極集電体６を介して負極２を負極缶４ｂに接続させ、この正極缶４ａと負極缶４ｂとを絶縁パッキン７によって電気的に絶縁させ、この電池内部で生じた化学エネルギーを正極缶４ａと負極缶４ｂの両端子から電気エネルギーとして外部へ取り出すようになっている。

【００２０】［自己放電率の測定］次に、上記のようにして作製した実施例１～５及び比較例１～５の各リチウム電池についてそれぞれ電池を作製した直後の放電容量Ｑ０と、作製した電池を８０℃で２ヶ月保存した後の放電容量Ｑ１とを測定し、下記の式によって各リチウム電池における自己放電率を求め、その結果を下記の表１に合わせて示した。

自己放電率（％）＝１００×（１－Ｑ１／Ｑ０）

【００２１】

【表１】

5　　6

	溶媒体積比			自己放電率 %
	EC	DME	γ－BL	
実施例1	90	0	10	5
実施例2	49.5	49.5	1	5
実施例3	47.5	47.5	5	5
実施例4	45	45	10	4
実施例5	40	40	20	5
比較例1	100	0	0	25
比較例2	50	50	0	19
比較例3	49.95	49.95	0.1	18
比較例4	49.75	49.75	0.5	16
比較例5	35	35	30	15
＊溶質　$LiCF_3SO_3$				

【0022】この結果から明らかなように、電解液の溶質に$LiCF_3SO_3$を用いると共に、その溶媒として、エチレンカーボネートと一緒に添加溶媒であるγ－ブチロラクトンを1～20体積%の範囲で加えた実施例1～5の各リチウム電池は、γ－ブチロラクトンを加えなかったり、その量が少なすぎたり、多すぎたりする比較例1～5の各リチウム電池に比べて、自己放電率が非常に低くなっていた。

【0023】（比較例6～9）これらの比較例において＊は、電解液における溶媒にエチレンカーボネートを用いないようにし、その溶媒として、プロピレンカーボネート（PC）とブチレンカーボネート（BC）と上記DMEとγ－BLとを下記の表2に示す体積比で混合させるようにし、それ以外については、上記の場合と同様にして各リチウム電池を作製すると共に各リチウム電池の自己放電率を求め、その結果を表2に合わせて示した。

【0024】

【表2】

	溶媒体積比	自己放電率　%
比較例6	PC：DME：γ－BL＝50：50：0	16
比較例7	PC：DME：γ－BL＝45：45：10	15
比較例8	BC：DME：γ－BL＝50：50：0	14
比較例9	BC：DME：γ－BL＝45：45：10	14
＊溶質　$LiCF_3SO_3$		

【0025】この結果から明らかなように、電解液における溶媒にエチレンカーボネートエチレンを使用しなかった比較例6～9のリチウム電池においては、電解液の溶質に$LiCF_3SO_3$を用いると共に、γ－ブチロラクトンを10体積%加えた場合であっても、上記の各実施例のリチウム電池に比べて自己放電率が非常に高くなっていた。

【0026】（実施例6及び比較例10～14）これらの実施例及び比較例のものにおいては、電解液の溶媒として上記のECとPCとBCとDMEとγ－BLとを下※記の表3に示す体積比で混合させるようにすると共に、電解液の溶質として、前記の$LiCF_3SO_3$にかえて、この発明において示したヘキサフルオロリン酸リチウム$LiPF_6$を用いるようにし、それ以外については、前記のようにして各リチウム電池を作製すると共に各リチウム電池の自己放電率を求め、その結果を表3に合わせて示した。

【0027】

【表3】

	溶媒体積比	自己放電率　％
実施例6	EC：DME：γ－BL＝45：45：10	4
比較例10	EC：DME：γ－BL＝50：50：　0	21
比較例11	PC：DME：γ－BL＝50：50：　0	18
比較例12	PC：DME：γ－BL＝45：45：10	17
比較例13	BC：DME：γ－BL＝50：50：　0	16
比較例14	BC：DME：γ－BL＝45：45：10	15
＊溶質　$LiPF_6$		

【００２８】この結果、電解液の溶質に本発明で示した$LiPF_6$を用いた場合、溶質に$LiCF_3SO_3$を用いた場合と同様に、電解液の溶媒として、エチレンカーボネートと一緒にγ－ブチロラクトンを１～２０体積％の範囲で加えた実施例６のリチウム電池は、溶媒にγ－ブチロラクトンを加えなかったり、エチレンカーボネートを使用しなかった比較例１０～１４の各リチウム電池に比べて、自己放電率が非常に低くなっていた。

【００２９】（比較例１５～１８）これらの比較例においては、電解液の溶媒に上記のＥＣとＤＭＥとγ－ＢＬ＊とを下記の表４に示す体積比で混合させると共に、その溶質としては本発明で示した上記の$LiCF_3SO_3$，$LiPF_6$以外の溶質を用いるようにし、比較例１５，１６においては溶質に$LiBF_4$を、比較例１７，１８においては溶質に$LiAlCl_4$を用いるようにし、それ以外については、前記のようにして各リチウム電池を作製すると共に各リチウム電池の自己放電率を求め、その結果を表４に合わせて示した。

【００３０】

【表４】

	溶媒体積比	溶質	自己放電率％
比較例15	EC：DME　：γ－BL＝50：50：　0	$LiBF_4$	21
比較例16	EC：DME　：γ－BL＝45：45：10	$LiBF_4$	22
比較例17	EC：DME　：γ－BL＝50：50：　0	$LiAlCl_4$	22
比較例18	EC：DME　：γ－BL＝45：45：10	$LiAlCl_4$	24

【００３１】この結果から明らかなように、電解液の溶質にこの発明で示した$LiCF_3SO_3$や$LiPF_6$以外の$LiBF_4$や$LiAlCl_4$を用いた場合、電解液の溶媒にエチレンカーボネートと一緒にγ－ブチロラクトンを１～２０体積％の範囲で加えたものを用いた場合においても、その自己放電率が実施例のものに比べて非常に高くなっていた。

【００３２】（実施例７，８及び比較例１９～２２）これらの実施例及び比較例のものにおいては、電解液の溶※媒に上記のＥＣとＰＣとＤＭＥとγ－ＢＬとを下記の表５に示す体積比で使用すると共に、溶質としては上記の$LiCF_3SO_3$を用いるようにし、それ以外については、前記のようにして各リチウム電池を作製すると共に各リチウム電池における自己放電率を求め、その結果を表５に合わせて示した。

【００３３】

【表５】

	溶媒体積比	自己放電率　%
実施例7	EC：PC：DME　：γ－BL＝30：30：30：10	2
実施例8	EC：BC：DME　：γ－BL＝30：30：30：10	1
比較例19	EC：PC：DME　：γ－BL＝33：33：33：　0	14
比較例20	EC：BC：DME　：γ－BL＝33：33：33：　0	13
比較例21	PC：BC：DME　：γ－BL＝33：33：33：　0	13
比較例22	PC：BC：DME　：γ－BL＝30：30：30：10	13
＊溶質　$LiCF_3SO_3$		

【００３４】この結果から明らかなように、電解液における溶媒として、エチレンカーボネートと一緒にγ－ブチロラクトンを１～２０体積％の範囲で加え、さらに１，２－ジメトキシエタンとプロピレンカーボネートを或いは１，２－ジメトキシエタンとブチレンカーボネートとを加えた実施例７，８のリチウム電池においては、その自己放電率が前記の各実施例におけるリチウム電池よりもさらに低くなっており、これらの混合溶媒を用いるとより効果があることが明らかになった。

【００３５】一方、γ－ブチロラクトンやエチレンカーボネートを含まない比較例１９～２２の各リチウム電池においては、自己放電率が各実施例のものに比べて高くなっていた。

【００３６】（実施例９～３５）これらの実施例において＊は、電解液における溶媒に上記のＥＣとＤＭＥを用いると共に、これに添加させる添加溶媒の種類を前記のγ－ＢＬの代わりに、この発明に示した他の添加溶媒である下記の表６～表８に示したラクトン，鎖状モノエーテル，鎖状トリエーテル，鎖状テトラエーテル，環状エーテル，鎖状炭酸エステル，３－プロピルシドノン，ベンゼンをそれぞれ同表に示す体積比で混合させ、また溶質としては前記の$LiCF_3SO_3$を使用し、それ以外については、前記のようにして各リチウム電池を作製すると共に各リチウム電池の自己放電率を求め、その結果を表６～表８に合わせて示した。

【００３７】

【表６】

	溶媒体積比	自己放電率　%
実施例９	EC：DME　：γ－バレロラクトン　＝45：45：10	5
実施例10	EC：DME　：β－ブチロラクトン　＝45：45：10	4
実施例11	EC：DME　：β－ブロピロラクトン＝45：45：10	4
実施例12	EC：DME　：δ－バレロラクトン　＝45：45：10	4
＊溶質　$LiCF_3SO_3$		

【００３８】　※　※【表７】

	溶媒体積比	自己放電率
実施例13	EC：DME ：ジエチルエーテル =45：45：10	5％
実施例14	EC：DME ：n－ブチルメチルエーテル=45：45：10	5％
実施例15	EC：DME ：イソプロピルエーテル =45：45：10	5％
実施例16	EC：DME ：メチルフェニルエーテル =45：45：10	4％
実施例17	EC：DME ：ジエチレングリコールジメチルエーテル =45：45：10	4％
実施例18	EC：DME ：ジエチレングリコールジエチルエーテル =45：45：10	5％
実施例19	EC：DME ：トリメトキシメタン =45：45：10	4％
実施例20	EC：DME ：トリエトキシメタン =45：45：10	4％
実施例21	EC：DME ：テトラメチルオルトカーボネート =45：45：10	5％
実施例22	EC：DME ：1,1,3,3-テトラエトキシプロパン =45：45：10	5％
実施例23	EC：DME ：テトラヒドロフラン =45：45：10	4％
実施例24	EC：DME ：2-メチルテトラヒドロフラン =45：45：10	3％
実施例25	EC：DME ：フラン =45：45：10	5％
実施例26	EC：DME ：2－メチルフラン =45：45：10	3％
実施例27	EC：DME ：ジオキソラン =45：45：10	5％
実施例28	EC：DME ：2－メチルジオキソラン =45：45：10	4％
実施例29	EC：DME ：4－メチルジオキソラン =45：45：10	4％
＊溶質 $LiCF_3SO_3$		

【0039】　　＊　＊【表8】

	溶媒体積比	自己放電率　％
実施例30	EC：DME ：炭酸ジメチル =45：45：10	5
実施例31	EC：DME ：炭酸エチルメチル =45：45：10	5
実施例32	EC：DME ：炭酸ジエチル =45：45：10	5
実施例33	EC：DME ：炭酸メチルプロピル =45：45：10	5
実施例34	EC：DME ：3－プロピルシドノン=45：45：10	5
実施例35	EC：DME ：ベンゼン =45：45：10	5
＊溶質 $LiCF_3SO_3$		

【0040】（実施例36～37）これらの実施例においては、電解液における溶媒に、上記のECとDMEを用いると共に、これに添加させる添加溶媒として、下記の表9に示すように2種類の添加溶媒を同表に示す体積比で混合させ、また溶質としては前記の$LiCF_3SO_3$※を使用し、それ以外については、前記のようにして各リチウム電池を作製すると共に各リチウム電池の自己放電率を求め、その結果を表9に合わせて示した。

【0041】

【表9】

	溶媒体積比	自己放電率　％
実施例36	EC：DME　：γ－BL：ジエチルエーテル ＝45：45：　5：　5	5
実施例37	EC：DME　：γ－BL：トリエトキシメタン ＝45：45：　5：　5	3
＊溶質　$LiCF_3SO_3$		

diethyl ether

triethoxymethane

【００４２】この結果から明らかなように、前記の添加溶媒を２種類組み合わせて使用した場合であっても、これらの体積％が１０～３０体積％の範囲にある実施例３６，３７の各リチウム電池においては、上記の各実施例と同様に、その自己放電率が各比較例のものに比べて著しく低下していた。

【００４３】（実施例３８～４１及び比較例２３～２６）これらの実施例及び比較例のものにおいては、電解液における溶媒として上記のEC，PC，DME，γ－BLを下記の表１０に示す体積比で混合させると共に、溶質としては前記の$LiCF_3SO_3$を使用した。また、＊上記のリチウム電池における負極に、リチウムにアルミニウムが１重量％含有されたＬｉ－Ａｌ合金，リチウムに錫が１重量％含有されたＬｉ－Ｓｎ合金，リチウムにインジウムが１重量％含有されたＬｉ－Ｉｎ合金，リチウムに鉛が１重量％含有されたＬｉ－Ｐｂ合金を用いるようにし、それ以外については、前記のようにして各リチウム電池を作製すると共に各リチウム電池の自己放電率を求め、その結果を表１０に合わせて示した。

【００４４】

【表１０】

	負極材料	溶媒体積比				自己放電率　％
		EC	PC	DME	γ－BL	
実施例38	Ｌｉ－Ａｌ	３０	３０	３０	１０	１
比較例23	Ｌｉ－Ａｌ	３３	３３	３３	０	１２
実施例39	Ｌｉ－Ｓｎ	３０	３０	３０	１０	１
比較例24	Ｌｉ－Ｓｎ	３３	３３	３３	０	１３
実施例40	Ｌｉ－Ｉｎ	３０	３０	３０	１０	１
比較例25	Ｌｉ－Ｉｎ	３３	３３	３３	０	１３
実施例41	Ｌｉ－Ｐｂ	３０	３０	３０	１０	２
比較例26	Ｌｉ－Ｐｂ	３３	３３	３３	０	１３
＊溶質　$LiCF_3SO_3$						

【００４５】この結果、負極にリチウム合金を使用した場合においても、電解液の溶質に前記の$LiCF_3SO_3$を用いると共に、その溶媒にエチレンカーボネートと一緒に添加溶媒であるγ－ブチロラクトンを１～２０体積％の範囲で加えた実施例３８～４１の各リチウム電池は、γ－ブチロラクトンを加えなかった比較例２３～２６の各リチウム電池に比べて、自己放電率が非常に低くなっていた。

【００４６】なお、上記の実施例においては、負極に金※50属リチウムとリチウム合金を用いた例を示しただけであるが、負極にリチウムイオンを吸蔵放出する金属酸化物や炭素材料を用いることも可能であり、この場合にも上記の各実施例のものとほぼ同様の結果が得られ、また添加溶媒として、上記の各実施例に示した以外のラクトン，鎖状モノエーテル，鎖状トリエーテル，鎖状テトラエーテル，環状エーテル，鎖状炭酸エステルを用い、またその組み合わせを変更させても、ほぼ同様の結果が得られる。

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【0047】

【発明の効果】以上詳述したように、この発明においては、正極活物質にマンガン酸化物を用いたリチウム電池において、その電解液における溶媒として少なくともエチレンカーボネートを用いると共に、前記の鎖状モノエーテル等の添加溶媒を１～２０体積%添加し、さらに溶質にトリフルオロメタンスルホン酸リチウム又はヘキサフルオロリン酸リチウムを使用したため、リチウム電池における自己放電が抑制され、長く保存した場合にも電

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池容量の減少が少なくなり、保存特性のよいリチウム電池が得られるようになった。

【図面の簡単な説明】

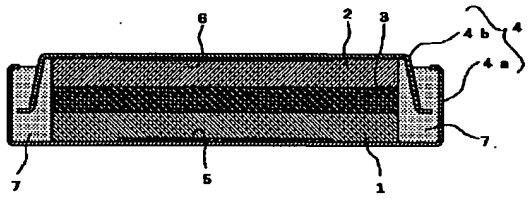
【図１】この発明の実施例及び比較例の各リチウム電池の構造を示した断面説明図である。

【符号の説明】

１　正極

２　負極

【図1】



【手続補正書】

【提出日】平成７年９月１８日

【手続補正１】

【補正対象書類名】明細書

【補正対象項目名】００３８

【補正方法】変更

【補正内容】

【００３８】

【表７】

	溶媒体積比	自己放電率
実施例13	EC：DME　：ジエチルエーテル　=45：45：10	5％
実施例14	EC：DME　：n－ブチルメチルエーテル=45：45：10	5％
実施例15	EC：DME　：イソプロピルエーテル　=45：45：10	5％
実施例16	EC：DME　：メチルフェニルエーテル　=45：45：10	4％
実施例17	EC：DME　：ジエチレングリコールジメチルエーテル　=45：45：10	4％
実施例18	EC：DME　：ジエチレングリコールジエチルエーテル　=45：45：10	5％
実施例19	EC：DME　：トリメトキシメタン　=45：45：10	4％
実施例20	EC：DME　：トリエトキシメタン　=45：45：10	4％
実施例21	EC：DME　：テトラメチルオルトカーボネート　=45：45：10	5％
実施例22	EC：DME　：1,1,3,3-テトラエトキシプロパン　=45：45：10	5％
実施例23	EC：DME　：テトラヒドロフラン　=45：45：10	4％
実施例24	EC：DME　：2-メチルテトラヒドロフラン　=45：45：10	3％
実施例25	EC：DME　：フラン　=45：45：10	5％
実施例26	EC：DME　：2－メチルフラン　=45：45：10	3％
実施例27	EC：DME　：ジオキソラン　=45：45：10	5％
実施例28	EC：DME　：2－メチルジオキソラン　=45：45：10	4％
実施例29	EC：DME　：4－メチルジオキソラン　=45：45：10	4％
＊溶質　$LiCF_3SO_3$		

フロントページの続き

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INVENTOR: DESHAMPS, M; KOTATO, M ; MORI, S ; SATO, T ; SHIMA, N ; SUZUKI, H

PATENT-ASSIGNEE: MITSUBISHI CHEM CORP[MITU]

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CN 1278953 A	January 3, 2001	N/A	000	H01M 010/40
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BASIC-ABSTRACT:

NOVELTY - A non-aqueous electrolyte cell comprises a negative electrode with lithium as active material, positive electrode, non-aqueous electrolyte containing a solvent and an organic solvent, separator and outer can.

DETAILED DESCRIPTION - A non-aqueous electrolyte cell comprises a negative electrode with lithium as active material, positive electrode, non-aqueous electrolyte containing a solvent and an organic solvent, separator and outer can. The organic solvent is 1 or more compounds of formula (I), and a collector applied as the positive electrode and a portion of the outer can in contact with the electrolyte on the side of the positive electrode are composed of a valve metal or its alloy.

R1-A-R2 (I)

R1, R2 = independently alkyl, optionally halogenated alkyl, or aryl optionally substituted by alkyl or halo;

R1 and R2 can be linked through -A- to form a cyclic structure with an unsaturated bond;

A = a group of formula (II)-(V).

-O-S(=O)-O- (II) -S(=O)2- (III) -S(=O)2-O- (IV) -OS(=O)2-O- (V)

USE - The non-aqueous electrolyte cell can be used as a secondary battery (claimed), and in electrical products and energy storage devices.

ADVANTAGE - The cell exhibits excellent low-temperature characteristics, long-term stability and safety, as well as cycle characteristics.

DESCRIPTION OF DRAWING(S) - The drawing shows the structure of a non-aqueous electrolyte cell.

Positive electrode 1

Negative electrode 2

Outer can 3

Sealing plate 4

Separator 5

Al foil 6

Gasket 7

Positive / negative electrode collector 8/9

CHOSEN-DRAWING:	Dwg.1/6
TITLE-TERMS:	NON AQUEOUS ELECTROLYTIC CELL USEFUL SECONDARY BATTERY CLAIM

DERWENT-CLASS: E19 L03 X16

CPI-CODES: E07-B01; E07-C; E10-A09A; L03-E01C; L03-E03;

EPI-CODES: X16-B01F; X16-E02;

CHEMICAL-CODES: Chemical Indexing M3 *01* Fragmentation Code C316 F011 F018 F213 K0 K4 K441 M280 M320 M413 M510 M521 M530 M540 M781 M904 M905 M910 Q454 Q615 R023 Specfic Compounds 01076K 01076U Registry Numbers 1076U

Chemical Indexing M3 *02* Fragmentation Code C216 F012 F310 K0 K4 K441 L9 L970 L999 M280 M320 M413 M510 M521 M530 M540 M781 M904 M905 Q454 Q615 R023 Ring Index 00105 Specfic Compounds A083CK A083CU

Chemical Indexing M3 *03* Fragmentation Code C316 F012 F018 F310 K0 K4 K441 L9 L970 M280 M320 M413 M510 M521 M530 M540 M781 M904 M905 Q454 Q615 R023 Ring Index 00131 Specfic Compounds 15967K 15967U

Chemical Indexing M3 *04* Fragmentation Code C216 K0 K4 K423 M210 M211 M272 M282 M320 M416 M620 M781 M904 M905 Q454 Q615 R023 Specfic Compounds A083GK A083GU

Chemical Indexing M3 *05* Fragmentation Code G001 G002 G010 G011 G012 G013 G019 G020 G021 G022 G029 G040 G100 G111 G221 G299 H600 H608 H641 H642 H643 H681 H682 H683 H689 K0 K4 K421 M121 M122 M124 M148 M210 M211 M212 M213 M214 M215 M216 M220 M221 M222 M223 M224 M225 M226 M231 M232 M233 M240 M272 M280 M281 M282 M311 M312 M313 M314 M315 M316 M320 M321 M322 M331 M332 M333 M334 M340 M342 M343 M344 M362 M391 M392 M414 M416 M510 M520 M531 M532 M540 M620 M781 M904 M905 Q454 Q615 R023 Markush Compounds 200002-63101-K 200002-63101-U

Chemical Indexing M3 *06* Fragmentation Code C316 G001 G002 G010 G011 G012 G013 G019 G020 G021 G022 G029 G040 G100 G111 G221 G299 H600 H608 H641 H642 H643 H681 H682 H683 H689 K0 K4 K442 M121 M122 M124 M142 M210 M211 M212 M213 M214 M215 M216 M220 M221 M222 M223 M224 M225 M226 M231 M232 M233 M240 M271 M280 M281 M282 M311 M312 M313 M314 M315 M316 M320 M321 M322 M331 M332 M333 M334 M340 M342 M343 M344 M362 M391 M392 M414 M416 M510 M520 M531 M532 M540 M620 M781 M904 M905 Q454 Q615 R023 Markush Compounds 200002-63102-K 200002-63102-U

Chemical Indexing M3 *07* Fragmentation Code G001 G002 G010 G011 G012 G013 G019 G020 G021 G022 G029 G040 G100 G111 G221 G299 H600 H608 H641 H642 H643 H681 H682 H683 H689 K0 K4 K432 M121 M122 M124 M147 M210 M211 M212 M213 M214 M215 M216 M220 M221 M222 M223 M224

M225 M226 M231 M232 M233 M240 M271 M272 M280 M281 M282 M311 M312 M313 M314 M315 M316 M320 M321 M322 M331 M332 M333 M334 M340 M342 M343 M344 M362 M391 M392 M414 M416 M510 M520 M531 M532 M540 M620 M781 M904 M905 Q454 Q615 R023 Markush Compounds 200002-63103-K 200002-63103-U

Chemical Indexing M3 *08* Fragmentation Code C216 G001 G002 G010 G011 G012 G013 G019 G020 G021 G022 G029 G040 G100 G111 G221 G299 H600 H608 H641 H642 H643 H681 H682 H683 H689 K0 K4 K423 M121 M122 M124 M148 M210 M211 M212 M213 M214 M215 M216 M220 M221 M222 M223 M224 M225 M226 M231 M232 M233 M240 M272 M280 M281 M282 M311 M312 M313 M314 M315 M316 M320 M321 M322 M331 M332 M333 M334 M340 M342 M343 M344 M362 M391 M392 M414 M416 M510 M520 M531 M532 M540 M620 M781 M904 M905 Q454 Q615 R023 Markush Compounds 200002-63104-K 200002-63104-U

UNLINKED-DERWENT-REGISTRY-NUMBERS: ; 1076U

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(30)Priority

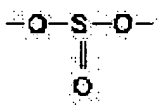
Priority number : 09254802 Priority date : 19.09.1997 Priority country : JP

(54) NONAQUEOUS ELECTROLYTE BATTERY

(57)Abstract:

PROBLEM TO BE SOLVED: To improve low temperature characteristics and long-term stability, and also a cycle characteristic in the case of a secondary battery by including at least one kind of sulfur containing organic compounds in an organic solvent an using a valve metal or its alloy for the material of a contact part with an electrolyte on a positive electrode collector and the positive electrode side of an external can.

SOLUTION: A compound used for an organic solvent is shown as R1-A-R2 where each of R1 and R2 is independently an alkyl group which may be substituted by an aryl group or a halogen atom, or an aryl group which may be substituted by an alkyl group or a halogen atom, or R1 and R2 are so combined together as to form a cyclic structure together with -A-, which may include an unsaturated bond, and A has a



structure illustrated in either of the formulas. For a valve metal or its alloy used for a positive electrode collector or the like, Al, Ti, Zr, Hf, Nb, Ta and an alloy containing those metals can be designated as an example. In particular, Al and its alloy are preferable because they have high energy density due to light weight.

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* NOTICES *

CLAIMS

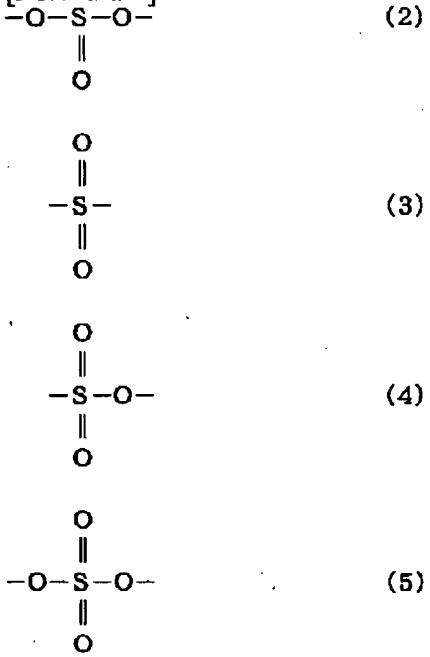
[Claim(s)]

[Claim 1] The nonaqueous electolyte cell characterized by the quality of the material of the charge collector used for the aforementioned positive electrode as the aforementioned organic solvent in the nonaqueous electolyte cell equipped with the nonaqueous electolyte which consists of the negative electrode which makes a lithium an active material, a positive electrode, a solute, and an organic solvent, separator, and the outside can, including the compound expressed with a formula (1) at least one kind, and the quality of the material for a wetted part with the electrolytic solution by the side of the positive electrode of the can outside the above being a valve metal or its alloy.

[Formula 1] R1 -A-R2 (1)

(Among a formula, R1 and R2 express the aryl group which may be replaced respectively independently by the alkyl group which may be replaced by the aryl group or the halogen atom, the alkyl group, or the halogen atom, or R1 and R2 form the cyclic structure which may join together mutually and may include the unsaturated bond with -A-, and A has the structure expressed with either of formula (2) - (5))

[Formula 2]



[Claim 2] It sets at an aforementioned ceremony (1) and is R1. And R2 It is the alkyl group of the carbon numbers 1-4 which may be replaced by the phenyl group or the halogen atom, or the phenyl group which may be replaced by the halogen atom, or is R1 respectively independently. R2 is a nonaqueous electolyte cell according to claim 1 characterized by forming the cyclic structure which may join together mutually and may include the unsaturated bond with -A-.

[Claim 3] The nonaqueous electolyte cell according to claim 1 or 2 characterized by being chosen from the group which the aforementioned valve metal or its alloy becomes from the alloy containing aluminum, Ti, Zr, Hf, Nb, Ta, and these metals.
[Claim 4] The nonaqueous electolyte cell according to claim 3 by which the aforementioned valve metal or its alloy is characterized by being aluminum or aluminum alloy.
[Claim 5] The nonaqueous electolyte cell according to claim 1 to 4 characterized by including one or more material chosen from the group which the aforementioned negative electrode becomes from the carbonaceous material which emits [occlusion and] a lithium, the metallic-oxide material which emits [occlusion and] a lithium, a lithium metal, and a lithium alloy.
[Claim 6] The nonaqueous electolyte cell according to claim 1 to 5 characterized by including one or more material chosen from the group which the aforementioned positive electrode becomes from the lithium transition-metals multiple-oxide material which emits [occlusion and] a lithium, the transition-metals oxide material which emits [occlusion and] a lithium, and carbonaceous material.
[Claim 7] The aforementioned solute LiClO4, LiPF6, LiBF4, and LiCF3 SO3, LiN (CF3 SO2)2 and LiN (CF3 CF2 SO2)2, LiN (CF3 SO2) (C4 F9 SO2) and LiC (CF3 SO2)3 from -- nonaqueous electolyte cell according to claim 1 to 6 characterized by being one or more lithium salt chosen from the becoming group
[Claim 8] The nonaqueous electolyte cell according to claim 1 to 7 by which the content of a compound expressed with the formula in the aforementioned organic solvent (1) is characterized by being 0.05 - 100vol%.
[Claim 9] The nonaqueous electolyte cell according to claim 1 to 8 by which solute concentration in the aforementioned nonaqueous electolyte is characterized by being 0.5-2.0 mols/l.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to a nonaqueous electolyte cell. Especially, a low-temperature property and long term stability are excellent, and in being a rechargeable battery, it relates with the nonaqueous electolyte cell of the high-energy density excellent in the cycle property.
[0002]
[Description of the Prior Art] The lithium cell with a high energy density attracts attention with lightweight-izing of an electric product in recent years, and the miniaturization. Moreover, the improvement of a cell property is also demanded with expansion of the application field of a lithium cell. As a solvent of the electrolytic solution of such a lithium cell, the non-drainage system organic solvent of carbonate, such as ethylene carbonate, propylene carbonate, diethyl carbonate, and gamma-butyrolactone, and ester is used.
[0003] Also in these, propylene carbonate is a high dielectric constant solvent, often melts a lithium salt system solute (electrolyte), and has the performance which was excellent as a main solvent of the electrolytic solution -- high conductivity is shown under low temperature. However, if propylene carbonate is used independently, the viscosity of the electrolytic solution will become high too much, and especially the electric discharge property in low temperature will fall remarkably. For this reason, although the mixed solvent which mixed 1 and 2-dimethoxyethane is used for propylene carbonate, as for 1 and 2-dimethoxyethane, the boiling point has a problem in a low sake in respect of long term stability or safety.
[0004] Moreover, the rechargeable battery using propylene carbonate may be accompanied by problems, such as the generation of gas, depending on the kind of electrode material. For example, if various graphite system electrode material is used independently, or occlusion and the electrode material which may be emitted, and graphite system electrode material are mixed and a lithium is used as a negative electrode, in order that propylene carbonate may decompose violently on a graphite-electrode front face, it is known that occlusion and discharge of the smooth lithium to a graphite electrode cannot be performed (7 th International Symposium on Li Batteries, P259, 1995 years).
[0005] Then, ethylene carbonate with comparatively few such decomposition reactions is used abundantly as a solvent of the electrolytic solution now. Since the congealing point is high compared with propylene carbonate (36.4 degrees C), ethylene carbonate is not used independently, and it mixes with hypoviscosity solvents, such as dialkyl carbonate, such as dimethyl carbonate and diethyl carbonate, dimethoxyethane, and a dioxolane, and it is used (a "functional material", the 15th volume, the April issue, the 48th page, 1995). However, if the boiling point generally adds a hypoviscosity solvent in large quantities a low sake, the vapor pressure in a cell will become high, and we are anxious about the fall of the safety by disclosure of a solvent. Moreover, as for a bird clapper, under low temperature, a problem has much solidification of the electrolytic solution, and lowness of conductivity. Under such a situation, the mixed solvent of ethylene carbonate and diethyl carbonate etc. is used for the

electrolytic solution for lithium secondary batteries. However, there is a problem that the cell using these electrolytic solutions of a cycle property is also inadequate.

[0006] In order to improve these troubles, using an ape fight compound as a solvent is proposed (for example, JP,6-302336,A, JP,7-122295,A, JP,8-96851,A, JP,9-120837,A, etc.). In these official reports, the electrolytic solution which used the ape fight compound has high conductivity, and since it is hypoviscosity, the low-temperature property of a cell etc. is reported to be good. Moreover, using a sulfolane compound as a solvent from the point of improvement in the cycle property in a rechargeable battery is also proposed (for example, JP,3-152879,A). However, if the compound which has S-O combination of an ape fight compound, a sulfolane compound, etc. is used for the electrolytic solution, it is found out that a cell does not operate normally. Especially, the fall of the cycle property in a rechargeable battery is remarkable, and in order to put in practical use, in addition, the room of an improvement is left behind.

[0007]

[Problem(s) to be Solved by the Invention] In view of the situation of such conventional technology, this invention chose the compound desirable as a solvent of a nonaqueous electolyte, and it made to find out the conditions on which the function is fully demonstrated in a cell into the technical problem which should be solved. Specifically, it excelled in a low-temperature property and long term stability, and, in the case of the rechargeable battery, made to offer the nonaqueous electolyte cell of the high-energy density excellent in the cycle property into the technical problem which should be solved.

[0008]

[Means for Solving the Problem] In order to solve such a technical problem, as a result of inquiring wholeheartedly, it found out that the nonaqueous electolyte cell which has the extremely excellent property could be offered by specifying the quality of the material of the positive-electrode charge collector with which this invention persons choose the specific compound which has S-O combination as a solvent of a nonaqueous electolyte, and the electrolytic solution contacts, and an outside can.

[0009] That is, this invention offers the nonaqueous electolyte cell characterized by the quality of the material of the charge collector used for the aforementioned positive electrode as the aforementioned organic solvent, including the compound expressed with a formula (1) at least one kind and the quality of the material for a wetted part with the electrolytic solution by the side of the positive electrode of the can outside the above being a valve metal or its alloy in the nonaqueous electolyte cell equipped with the nonaqueous electolyte which consists of the negative electrode which makes a lithium an active material, a positive electrode, a solute, and an organic solvent, separator, and the outside can

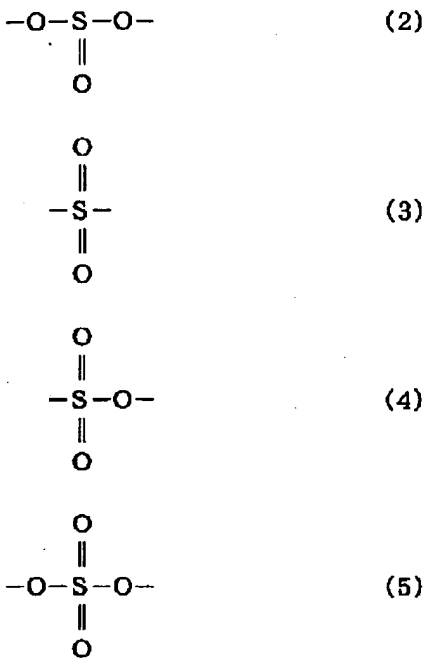
[0010]

[Formula 3] R1 -A-R2 (1)

(Among a formula, R1 and R2 express the aryl group which may be replaced respectively independently by the alkyl group which may be replaced by the aryl group or the halogen atom, the alkyl group, or the halogen atom, or R1 and R2 form the cyclic structure which may join together mutually and may include the unsaturated bond with -A-, and A has the structure expressed with either of formula (2) - (5))

[0011]

[Formula 4]



(2)

(3)

(4)

(5)

[0012] As for the valve metal used by this invention, or its alloy, it is desirable that it is an alloy containing aluminum, Ti, Zr, Hf, Nb, Ta, and these metals, and it is more desirable that they are aluminum or aluminum alloy. Negative-electrode material can choose from carbonaceous material, the metallic-oxide material which emits [occlusion and] a lithium, a lithium metal, and lithium alloys, such as a graphite which emits [occlusion and] a lithium. Positive-electrode material can choose a lithium from occlusion and the lithium transition-metals multiple-oxide material which can be emitted, transition-metals oxide material, and carbonaceous material. As a solute, it is LiClO4, LiPF6, LiBF4, LiCF3 SO3, LiN (CF3 SO2)2, LiN (CF3 CF2 SO2)2, and LiN (CF3SO2) (C4 F9 SO2) and LiC (CF3 SO2)3. It can illustrate. As for the content of a compound expressed with the formula in an organic solvent (1), it is desirable to set it as 0.05 - 100vol% of within the limits. Moreover, as for the solute concentration of the electrolytic solution, it is desirable to set [1.] up in 0.5-2.0 mols /.

[0013]

[Embodiments of the Invention] The operation gestalt of the nonaqueous electolyte cell of this invention is explained in detail below. The nonaqueous electolyte cell of this invention makes it indispensable requirements to include at least one kind of compound expressed with a formula (1) as an organic solvent of the electrolytic solution. R1 of a compound expressed with a formula (1) And R2 The aryl group which may be replaced by the alkyl group which may be replaced respectively independently by the aryl group or the halogen atom, the alkyl group, or the halogen atom is expressed, or it is R1. R2 The cyclic structure which may join together mutually and may include the unsaturated bond with -A- is formed.

[0014] R1 And R2 The alkyl group which can be taken is an alkyl group of carbon numbers 1-4 preferably, and can specifically mention a methyl group, an ethyl group, a propyl group, an isopropyl machine, and a butyl. As an aryl group used as the substituent of an alkyl group, although a phenyl group, a naphthyl group, an anthranil, etc. can be mentioned, a phenyl group is desirable. Moreover, as a halogen atom used as the substituent of an alkyl group, a fluorine atom, a chlorine atom, and a bromine atom can be used preferably. Two or more these substituents may be replaced by the alkyl group, and both the aryl group and the halogen atom may replace them.

[0015] R1 R2 The cyclic structures which combine mutually and are formed with -A- are more than 4 member rings, and may include the double bond or the triple bond. R1 R2 As a joint machine which combines each other and is formed, for example, -CH2-, - CH2 CH2-, -CH2 CH2 CH2-, -CH2 CH2 CH2 CH2-, - CH2 CH2 CH2 CH2 CH2-, -CH=CH-, -CH=CHCH2-, -CH=CHCH2 CH2-, -CH2 CH=CHCH2-, and -CH2 CH2 C**CCH2 CH2- can be illustrated. These one or more hydrogen atoms

may be replaced by the alkyl group, the halogen atom, the aryl group, etc.
[0016] As an example of a compound of having the structure where A is expressed with a formula (2), a dimethyl ape fight, A diethyl ape fight, an ethyl methyl ape fight, a methylpropyl ape fight, An ethyl propyl ape fight, a diphenyl ape fight, a methylphenyl ape fight, An ethyl ape fight, a dibenzyl ape fight, a benzyl methyl ape fight, Chain-like ape fights, such as a benzyl ethyl ape fight; An ethylene ape fight, A propylene ape fight, a butylene ape fight, a vinylene ape fight, The halogenide of annular ape fight [, such as a phenylethylene ape fight, a 1-methyl-2-phenylethylene ape fight, and a 1-ethyl-2-phenylethylene ape fight]; and these chain-like ape fights, or an annular ape fight can be mentioned.
[0017] As an example of a compound of having the structure where A is expressed with a formula (3), a dimethyl sulfone, A diethyl sulfone, an ethyl methyl sulfone, a methylpropyl sulfone, An ethyl propyl sulfone, diphenylsulfone, a methylphenyl sulfone, An ethyl phenyl sulfone, a dibenzyl sulfone, a benzyl methyl sulfone, Chain-like sulfones, such as a benzyl ethyl sulfone; A sulfolane, 2-methyl sulfolane, 3-methyl sulfolane, 2-ethyl sulfolane, 3-ethyl sulfolane, The halogenide of annular sulfones [, such as 2, 4-dimethyl sulfolane, sulfolene, 3-methylsulfolene, 2-phenyl sulfolane, and 3-phenyl sulfolane,]; and the above-mentioned chain-like sulfone, or an annular sulfone etc. can be mentioned.
[0018] As an example of a compound of having the structure where A is expressed with a formula (4), a methansulfonic acid methyl, Methansulfonic acid ethyl, a methansulfonic acid propyl, an ethane-sulfonic-acid methyl, Ethane-sulfonic-acid ethyl, an ethane-sulfonic-acid propyl, a benzenesulfonic-acid methyl, Benzenesulfonic-acid ethyl, a benzenesulfonic-acid propyl, a methansulfonic acid phenyl, An ethane-sulfonic-acid phenyl, a propane sulfonic-acid phenyl, a benzyl sulfonic-acid methyl, Benzyl sulfonic-acid ethyl, a benzyl sulfonic-acid propyl, a methansulfonic acid benzyl, Chain-like sulfonates, such as an ethane-sulfonic-acid benzyl and a propane sulfonic-acid benzyl : 1, 3-propane sultone, The halogenide of annular sulfonates [, such as 1, 4-butane sultone, the 3-phenyl -1, 3-propane sultone, the 4-phenyl -1 and 4-butane sultone,]; and the above-mentioned chain-like sulfonate, or an annular sulfonate can be mentioned.
[0019] As an example of a compound of having the structure where A is expressed with a formula (5), a dimethyl sulfate, A diethyl sulfate, an ethyl-sulfate methyl, sulfuric-acid methylpropyl, an ethyl-sulfate propyl, Sulfuric-acid methylphenyl, an ethyl-sulfate phenyl, sulfuric-acid phenylpropyl, Chain-like sulfates, such as a sulfuric-acid benzyl methyl and sulfuric-acid benzyl ethyl; An ethylene glycol sulfate, 1, 2-propanediol sulfate, 1, 3-propanediol sulfate, 1, 2-butanediol sulfate, 1, 3-butanediol sulfate, 2, 3-butanediol sulfate, a phenylethylene glycol sulfate, The halogenide of annular sulfates [, such as a methylphenyl ethylene glycol sulfate and an ethyl phenylethylene glycol sulfate,]; and the above-mentioned chain-like sulfate, or an annular sulfate can be mentioned.
[0020] Only one kind may be chosen and used for the compound expressed with these formulas (1), and may be used for it combining two or more kinds. When using it combining two or more kinds of compounds, the compound with which the structures of A differ can also be mixed and used. As for the amount of compounds of the formula (1) contained in the organic solvent in a nonaqueous electolyte, it is desirable that it is 0.05 - 100vol% of within the limits. below the amount of saturation dissolutions to the organic solvent used in that case although a solid thing is also in the compound expressed with a formula (1) at a room temperature -- desirable -- the amount of saturation dissolutions -- it is more preferably used 60 or less % of the weight in 30 or less % of the weight of the range of the amount of saturation dissolutions It is a book when the content of the compound of a formula (1) becomes less than [0.05vol%]. In addition, the range indicated using "-" in this specification includes the numeric value indicated before and behind it.
[0021] Solvents other than the compound expressed with a formula (1) can also be used for the organic solvent in a nonaqueous electolyte. For example, annular carbonate, such as ethylene carbonate, propylene carbonate, and butylene carbonate; Dimethyl carbonate, Chain-like carbonate, such as diethyl carbonate and ethyl methyl carbonate; Gamma-butyrolactone, cyclic-ester [, such as gamma-valerolactone,]; -- the shape of a chain, such as methyl acetate and a methyl propionate, -- an ester; tetrahydrofuran -- Cyclic ether, such as 2-methyl tetrahydrofuran and a tetrahydropyran; Dimethoxyethane, Chain-like ether, such as a dimethoxymethane; Cyclic-phosphoric-acid ester;

trimethyl phosphate, such as a phosphoric-acid ethylene methyl and phosphoric-acid ethyl ethylene, Chain-like phosphoric ester, such as phosphoric-acid triethyl; sulfur-containing organic solvents other than the compound expressed with halogenide [of these compounds]; and a formula (1) etc. can be used. These organic solvents may choose and use only one kind, and it may be used for them combining two or more kinds.

[0022] As a solute used for a nonaqueous electolyte, LiClO4 and LiPF6, Inorganic lithium salt of LiBF4 grade; LiCF3 SO3 and LiN (CF3 SO2)2, LiN (CF3 CF2 SO2)2, and LiN (CF3 SO2) (C4 F9 SO2) and LiC (CF3 SO2)3 etc. -- fluorine-containing organic lithium salt etc. can be mentioned Only one kind may be chosen and used for these solutes, and may be used for them combining two or more kinds. As for the mol concentration in the electrolytic solution of the lithium salt which is a solute, it is desirable that it is within the limits of 0.5-2.0 mols/l. When mol concentration exceeds l. in less than 0.5 mols [l.] /or 2.0 mols /, the conductivity of the electrolytic solution is low and there is an inclination for the performance of a cell to fall.

[0023] The negative electrode which constitutes the nonaqueous electolyte cell of this invention is a negative electrode which makes a lithium an active material. In this specification, it means that a lithium metal, a lithium compound, or a lithium ion participates in electrode reaction, saying "let a lithium be an active material." Metallic-oxide material which can emit [occlusion and] lithiums, such as a carbonaceous material; tin oxide which can emit [occlusion and] lithiums, such as a decomposition product which pyrolyzed the organic substance, for example under various conditions as a material which constitutes a negative electrode, difficulty graphite nature carbon, an artificial graphite, and a natural graphite, and oxidization silicon; lithium metal; and various lithium alloys can be used. Only one kind may be chosen and used for such negative-electrode material, and may be used for them combining two or more kinds.

[0024] Especially the method of manufacturing a negative electrode is not restricted using such negative-electrode material. For example, binding material, electric conduction material, a solvent, etc. can be added to negative-electrode material if needed, it can be made the shape of a slurry, and an electrode can be manufactured by applying to the substrate of a charge collector and drying. Moreover, roll forming of this electrode material is carried out as it is, and it can fabricate in the shape of a sheet, or can also fabricate in the shape of a pellet with compression molding etc.

[0025] If the binding material used for manufacture of an electrode is a stable material to the solvent and the electrolytic solution which are used at the time of electrode manufacture, especially the kind will not be restricted. Specifically Polyethylene, polypropylene, a polyethylene terephthalate, Resin system macromolecules, such as an aromatic polyamide and a cellulose; Styrene-butadiene rubber, Rubber-like macromolecules, such as polyisoprene rubber, butadiene rubber, and ethylene-propylene rubber; A styrene butadiene styrene block copolymer and its hydrogenation object, styrene ethylene butadiene styrene block-copolymer and its hydrogenation object; -- thermoplastic-elastomer-like macromolecules [, such as a styrene isoprene styrene block copolymer and its hydrogenation object,]; -- syndiotactic 1 and 2-polybutadiene -- Elasticity resin-like macromolecules, such as an ethylene vinylacetate copolymer, and a propylene, an alpha olefin (carbon numbers 2-12) copolymer; fluorine system macromolecules, such as a polyvinylidene fluoride, a polytetrafluoroethylene, and a polytetrafluoroethylene ethylene copolymer, can be illustrated.

[0026] Moreover, the macromolecule constituent which has alkali-metal ion conductivity, such as a lithium ion, especially can also be used as binding material. As a macromolecule which has such ion conductivity Polyether system high molecular compounds, such as a polyethylene oxide and a polypropylene oxide, The crosslinked-polymer compound of a polyether, a polyepichlorohydrin, poly force FAZEN, A polysiloxane, a polyvinyl pyrrolidone, poly vinylidene carbonate, The system which compounded the alkali-metal salt which makes lithium salt or a lithium a subject with high molecular compounds, such as a polyacrylonitrile Or the system which blended with this the organic compound which has high dielectric constants, such as propylene carbonate, ethylene carbonate, and gamma-butyrolactone, can be used. You may combine and use such material.

[0027] Various kinds of gestalten can be taken as a mixed form of negative-electrode material and the

above-mentioned binding material. That is, the gestalt which both particle mixed, the gestalt mixed in the form where fibrous binding material becomes entangled with the particle of negative-electrode material, or the gestalt with which the layer of binding material adhered to the particle front face is mentioned. The mixed rate of the above-mentioned binding material to the fine particles of negative-electrode material is 0.5 - 10 % of the weight more preferably 0.1 to 30% of the weight to negative-electrode material. When the binding material of the amount exceeding 30 % of the weight is added, it is in the inclination for the internal resistance of an electrode to become large, and by the binding material of less than 0.1% of the weight of an amount, it is in the inclination which is inferior in the binding property of a charge collector and negative-electrode material conversely.

[0028] Moreover, on the occasion of mixture with negative-electrode material and binding material, you may mix electric conduction material collectively. Since it is not restricted, even if especially the kind of electric conduction material to be used is a metal, it may be nonmetallic. As metaled electric conduction material, the material which consists of metallic elements, such as Cu and nickel, can be mentioned. Moreover, as nonmetallic electric conduction material, carbon materials, such as graphite, carbon black, acetylene black, and KETCHIEN black, can be mentioned. As for the mean particle diameter of electric conduction material, it is desirable that it is 1 micrometer or less.

[0029] The mixed rate of electric conduction material is more preferably carried out to 0.5 - 15% of the weight 0.1 to 30% of the weight to negative-electrode material. Charge-and-discharge capacity of the electrode per unit volume can be made comparatively high by ****ing the mixed rate of electric conduction material to 30 or less % of the weight. Moreover, the electric conduction path of electric conduction material can fully be formed in an electrode by carrying out the mixed rate of electric conduction material to 0.1% of the weight or more.

[0030] Negative-electrode material and the above-mentioned mixture containing binding material at least are applied on a charge collector according to the purpose of using an electrode. Especially the configuration of the charge collector to apply is not restricted, but can be suitably determined according to the use mode of a negative electrode etc. For example, the charge collector of the shape of the shape of a pillar, a tabular, and a coil can be used. In these, it is desirable that they are metals, such as copper, nickel, and stainless steel, and it is easy to process it into a thin film, and since the quality of the material of a charge collector is cheap, although copper foil is used for it, it is more desirable.

[0031] A well-known means can perform application to a charge collector to this contractor. When mixture is a slurry-like, it can apply on a charge collector using a die coating machine, a doctor blade, etc. Moreover, when mixture is a paste-like, it can apply on a charge collector by roller coating etc. When the solvent is being used, an electrode can be produced by drying and removing a solvent.

[0032] The material which can emit [occlusion and] lithiums, such as carbonaceous material, such as transition-metals oxide material; graphites [, such as lithium transition-metals multiple-oxide material; manganese dioxide,] etc. fluoride, such as for example, a lithium cobalt oxide, a lithium nickel oxide, and a lithium manganic acid ghost, can be used for the positive electrode which constitutes the nonaqueous electolyte cell of this invention. concrete -- LiFeO2, LiCoO2, LiNiO2, and LiMn 2O4 and -- these -- un--- a law -- a ratio compound, MnO2, TiS2, FeS2, Nb3 S4, Mo3 S4, CoS2, and V -- 2O5, P2 O5, CrO3, V3 O3, TeO2, and GeO2 etc. -- it can use Especially the manufacture method of a positive electrode is not restricted, but can be manufactured by the manufacture method of the above-mentioned negative electrode, and the same method.

[0033] A valve metal or its alloy is used for the positive-electrode charge collector used by this invention. In this specification, it is the same meaning as a well-known term, namely, the metal which forms a passive state coat in a front face according to the anodic oxidation in the inside of the electrolytic solution is meant as a "valve metal." As a valve metal, the metals belonging to IIIa, IVa, and Va group (3B, 4B, 5B group) and these alloys can be illustrated. The alloy containing aluminum, Ti, Zr, Hf, Nb, Ta, and these metals etc. can specifically be illustrated, and the alloy containing aluminum, Ti, Ta, and these metals can be used preferably. Since especially aluminum and its alloy are lightweight, its energy density is high and is desirable.

[0034] Since the front face is being worn by the oxide skin, a valve metal can prevent effectively that the

compound expressed with a formula (1) carries out oxidative degradation in a part for a wetted part with the electrolytic solution. On the other hand, when metallic materials other than valve metals, such as stainless steel, are used, the oxidative degradation of a compound which has S-O combination cannot be prevented. Therefore, according to this invention, mothball nature can be raised in a primary cell and a cycle property can be effectively raised with a rechargeable battery.

[0035] A valve metal or its alloy is used about a part for a wetted part with the electrolytic solution by the side of the positive electrode of an outside can as well as a positive-electrode charge collector. The whole outside can may be constituted from a valve metal or its alloy, and only a part for a wetted part may be protected with a valve metal or its alloy. As a former example, the example which uses aluminum and aluminum alloy as an outside can can be given. Moreover, the example from which a part for the stainless wetted part suitably used as a can outside a cell was protected with aluminum or aluminum alloy as a latter example can be given. As a method of protecting with a valve metal, the method of protecting with plating or a foil can be illustrated. In addition, portions, such as a relief valve which operates when the internal pressure inside the lead wire contained inside the cell or a cell rises, are also contained in the term the "outside can" used on these specifications.

[0036] Especially the quality of the material or the configuration of a separator that are used for the cell of this invention are not restricted. It dissociates so that a positive electrode and a negative electrode may not contact physically, and ionic permeability of a separator is high, and it is desirable that electric resistance is a low thing. Separator is stable to the electrolytic solution and it is desirable to choose from the material excellent in solution retention. Specifically, the above-mentioned electrolytic solution can be infiltrated using the porous sheet or nonwoven fabric which uses polyolefines, such as polyethylene and polypropylene, as a raw material.

[0037] Especially the method of manufacturing a nonaqueous electolyte cell using the above-mentioned nonaqueous electolyte, a negative electrode, a positive electrode, an outside can, and separator can be suitably chosen from the methods which are not limited but are usually adopted. A gasket, an obturation board, a cell case, etc. can also be used for the nonaqueous electolyte cell of this invention if needed besides a nonaqueous electolyte, a negative electrode, a positive electrode, an outside can, and separator. The process puts a negative electrode for example, on an outside can, it can form the electrolytic solution and separator on it, it can put a positive electrode so that it may counter with a negative electrode further, and it can use it as a cell in total in a gasket and an obturation board. Especially the configuration of a cell is not restricted but can make the cylinder type, pellet electrode, and separator of the inside-out configuration which combined the cylinder type, pellet electrode, and separator which made a sheet electrode and separator the shape of a spiral the coin type which carried out the laminating.

[0038]

[Example] An example is given to below and this invention is explained to it still more concretely. The material shown below, the amount used, a rate, operation, etc. can be suitably changed, unless it deviates from the pneuma of this invention. Therefore, the range of this invention is not restricted to the example shown below.

[0039] (Examples 1-13) Carbon black (6 weight sections) and the polyvinylidene fluoride (4 weight sections) were added to LiCoO2 (90 weight sections) which is positive-electrode material, and it mixed, it distributed by the N-methyl-2-pyrrolidone, and was made the slurry. It applied uniformly on aluminum foil with a thickness of 20 micrometers which is a positive-electrode charge collector, and after dryness, this slurry was pierced in the predetermined configuration and made into the positive electrode.

[0040] The polyvinylidene fluoride (10 weight sections) was mixed to the artificial-graphite powder (the TIMCAL, LTD. make, tradename:KS-44) (90 weight sections) which is negative-electrode material, and it distributed by the N-methyl-2-pyrrolidone, and was made the shape of a slurry. This slurry was uniformly applied on copper foil with a thickness of 18 micrometers which is a negative-electrode charge collector, and after dryness, it pierced in the predetermined configuration and considered as the negative electrode.

[0041] About the electrolytic solution, an ethylene ape fight (ES), a dimethyl ape fight (DMS), A sulfolane (SLA), sulfolene (systemic lupus erythematosus), 1, 3-propane sultone (PSL), The ethylene carbonate (EC) which is annular carbonate, the diethyl carbonate which is chain-like carbonate (DEC), The gamma-butyrolactone (GBL) which is cyclic ester, the methyl propionate which is chain-like ester (MP), To the solvent mixed by the tetrahydrofuran (THF) which is cyclic ether, and the composition which shows the dimethoxyethane (DME) which is the chain-like ether in Table 1 It prepared by dissolving the 6 fluoride [phosphoric-acid] lithium (LiPF6) fully dried as a solute under dryness argon atmosphere so that it may become [1.] in one mol /.

[0042] The coin type nonaqueous electolyte cell shown in drawing 1 was produced under dryness argon atmosphere using these positive electrodes, a negative electrode, and the electrolytic solution. That is, the positive electrode 1 and the negative electrode 2 were held in the positive-electrode can (outside can) 3 and the obturation board 4 made from stainless steel, respectively, and the laminating was carried out through the separator 5 which consists of a microporosity film of the polyethylene into which the electrolytic solution was infiltrated. In order to use the quality of the material for a wetted part by the side of a positive electrode as a valve metal at this time, what covered the inside of the positive-electrode can 3 with the aluminum foil 6 beforehand was used. Then, caulking seal of the positive-electrode can 3 and the obturation board 4 was carried out through the gasket 7, and the coin type cell was produced.

[0043] (Examples 1-9 of comparison) Except for the point using the positive-electrode can which is not covered with the inside with the aluminum foil 6, the coin type cell was produced like the above-mentioned examples 1-5, and 10-13. In 25 degrees C, charge final-voltage 4.2V were performed by the 0.5mA constant current, and the charge and discharge test was performed for each cell of examples 1-13 and the examples 1-9 of comparison by discharge-final-voltage 2.5V. The charge capacity and service capacity of 1 cycle eye per negative-electrode weight in each cell are shown in Table 1. Moreover, change of the service capacity per [the charge-and-discharge cycle of an example 2 and the example 2 of comparison] negative-electrode weight is shown in drawing 2 , and change of the service capacity per / the charge-and-discharge cycle of an example 13 and the example 9 of comparison] negative-electrode weight is shown in drawing 3 .

[0044]

[Table 1]

	溶媒組成（体積%）	初期充電容量 (mAh/g)	初期放電容量 (mAh/g)
実施例1	ES=100	243	153
比較例1	ES=100	1143	2
実施例2	ES：EC=50：50	287	220
比較例2	ES：EC=50：50	410	20
実施例3	ES：DEC=50：50	230	90
比較例3	ES：DEC=50：50	240	47
実施例4	ES：DEC=20：80	310	192
比較例4	ES：DEC=20：80	350	95
実施例5	ES：DEC=1：99	250	176
比　例5	ES：DEC=1：99	95	40
実施例6	ES：GBL=50：50	262	128
実施例7	ES：MP=50：50	273	182
実施例8	ES：THF=50：50	297	228
実施例9	ES：DME=50：50	273	203
実施例10	DMS：EC=50：50	394	122
比較例6	DMS：EC=50：50	598	87
実施例11	SLA：DEC=50：50	363	219
比較例7	SLA：DEC=50：50	358	186
実施例12	SLE：EC：DEC=10：45：45	320	49
比較例8	SLE：EC：DEC=10：45：45	206	0
実施例13	PSL：EC：DEC=10：45：45	289	244
比較例9	PSL：EC：DEC=10：46：45	281	231

[0045] Since the oxidative degradation of the compound by which the quality of the material for a wetted part by the side of a positive electrode is expressed with the formula (1) contained in the electrolytic solution in the case of stainless steel etc. advances so that clearly from Table 1, drawing 2 , and drawing 3 , sufficient service capacity cannot be obtained. To it, when the quality of the material for a wetted part by the side of a positive electrode is aluminum, this oxidative degradation is suppressed and service capacity and the cycle property are improved remarkably.

[0046]

[Effect of the Invention] By choosing the compound expressed with a formula (1) as an organic solvent of the electrolytic solution, and using a valve metal or its alloy for a part for a wetted part with the electrolytic solution of a positive-electrode charge collector and the can outside a positive-electrode side, it excels in a low-temperature property and long term stability, and, in the case of a rechargeable battery, the nonaqueous electolyte cell excellent in the cycle property can be offered. This nonaqueous electolyte cell can be broadly applied to an electric product, an energy-storage facility, etc.

[Translation done.]

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最終頁に続く

(54)【発明の名称】　非水系電解液電池

(57)【要約】

【課題】　低温特性および長期安定性に優れ、二次電池として利用する場合にはサイクル特性に優れている非水系電解液電池を提供すること。

【解決手段】　リチウムを活物質とする負極、正極、溶質および有機溶媒からなる非水系電解液、セパレータおよび外缶を備えた非水系電解液電池において、前記有機溶媒としてＳ－Ｏ結合を有する化合物（例えばジメチルサルファイト、エチレンサルファイト、スルファラン、スルフォレン、１，３－プロパンスルトン等）を含み、前記正極に用いた集電体の材質および前記外缶の正極側における電解液との接液部分の材質が弁金属またはその合金であることを特徴とする非水系電解液電池。

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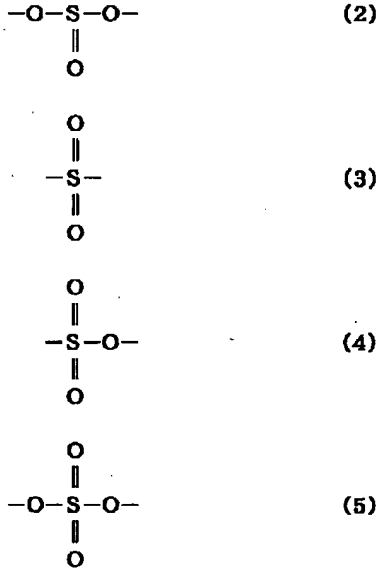
【特許請求の範囲】

【請求項1】　リチウムを活物質とする負極、正極、溶質および有機溶媒からなる非水系電解液、セパレータおよび外缶を備えた非水系電解液電池において、前記有機溶媒として、式（1）で表される化合物を少なくとも一種類含み、前記正極に用いた集電体の材質および前記外缶の正極側における電解液との接液部分の材質が弁金属またはその合金であることを特徴とする非水系電解液電池。

【化1】$R_1 - A - R_2$　　（1）

（式中、R_1 およびR_2 は各々独立して、アリール基またはハロゲン原子で置換されていてもよいアルキル基、もしくはアルキル基またはハロゲン原子で置換されていてもよいアリール基を表すか、R_1 とR_2 は互いに結合して－A－とともに不飽和結合を含んでいてもよい環状構造を形成し、Aは式（2）～（5）のいずれかで表される構造を有する）

【化2】



(2)

(3)

(4)

(5)

【請求項2】　前記式（1）において、R_1 およびR_2 が各々独立して、フェニル基またはハロゲン原子で置換されていてもよい炭素数1～4のアルキル基、もしくはハロゲン原子で置換されていてもよいフェニル基であるか、R_1 とR_2 は互いに結合して－A－とともに不飽和結合を含んでいてもよい環状構造を形成することを特徴とする請求項1に記載の非水系電解液電池。

【請求項3】　前記弁金属またはその合金が、Al、Ti、Zr、Hf、Nb、Taおよびこれらの金属を含む合金からなる群から選択されることを特徴とする請求項1または2に記載の非水系電解液電池。

【請求項4】　前記弁金属またはその合金が、Alまたは Al合金であることを特徴とする請求項3に記載の非水系電解液電池。

【請求項5】　前記負極が、リチウムを吸蔵および放出

2

可能な炭素質材料、リチウムを吸蔵および放出可能な金属酸化物材料、リチウム金属およびリチウム合金からなる群から選択される1以上の材料を含むことを特徴とする請求項1～4のいずれかに記載の非水系電解液電池。

【請求項6】　前記正極が、リチウムを吸蔵および放出可能なリチウム遷移金属複合酸化物材料、リチウムを吸蔵および放出可能な遷移金属酸化物材料および炭素質材料からなる群から選択される1以上の材料を含むことを特徴とする請求項1～5のいずれかに記載の非水系電解液電池。

【請求項7】　前記溶質が、$LiClO_4$、$LiPF_6$、$LiBF_4$、$LiCF_3SO_3$、$LiN(CF_3SO_2)_2$、$LiN(CF_3CF_2SO_2)_2$、$LiN(CF_3SO_2)(C_4F_9SO_2)$および$LiC(CF_3SO_2)_3$ からなる群から選択される1以上のリチウム塩であることを特徴とする請求項1～6のいずれかに記載の非水系電解液電池。

【請求項8】　前記有機溶媒中の式（1）で表される化合物の含有量が、0.05～100vol%であることを特徴とする請求項1～7のいずれかに記載の非水系電解液電池。

【請求項9】　前記非水系電解液中の溶質濃度が、0.5～2.0モル／リットルであることを特徴とする請求項1～8のいずれかに記載の非水系電解液電池。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、非水系電解液電池に関する。特に、低温特性および長期安定性が優れ、二次電池の場合にはサイクル特性に優れた高エネルギー密度の非水系電解液電池に関するものである。

【0002】

【従来の技術】近年の電気製品の軽量化、小型化にともない、高いエネルギー密度を持つリチウム電池が注目されている。また、リチウム電池の適用分野の拡大に伴い電池特性の改善も要望されている。このようなリチウム電池の電解液の溶媒として、例えばエチレンカーボネート、プロピレンカーボネート、ジエチルカーボネート、γ－ブチロラクトン等のカーボネート類やエステル類の非水系有機溶媒が用いられている。

【0003】これらの中でもプロピレンカーボネートは高誘電率溶媒であり、リチウム塩系溶質（電解質）をよく溶かし、低温下においても高い電気伝導率を示すなど電解液の主溶媒として優れた性能を有している。しかしながら、プロピレンカーボネートを単独で用いると電解液の粘度が高くなり過ぎ、特に低温での放電特性が著しく低下してしまう。このためプロピレンカーボネートに1，2－ジメトキシエタンを混合した混合溶媒が用いられているが、1，2－ジメトキシエタンは沸点が低いために、長期安定性や安全性の面で問題がある。

【0004】また、プロピレンカーボネートを用いた二

次電池は、電極材の種類によってはガス発生等の問題をともなうことがある。例えば、種々の黒鉛系電極材を単独で使用したり、リチウムを吸蔵および放出し得る電極材と黒鉛系電極材とを混合して負極として使用すると、プロピレンカーボネートが黒鉛電極表面で激しく分解するために黒鉛電極へのスムーズなリチウムの吸蔵・放出ができないことが知られている（7th International Symposium on Li Batteries,P259,1995 年）。

【０００５】そこで現在では、このような分解反応が比較的少ないエチレンカーボネートが電解液の溶媒として多用されている。エチレンカーボネートはプロピレンカーボネートに比べて凝固点が高い（３６．４℃）ために単独で用いられることはなく、ジメチルカーボネートやジエチルカーボネート等のジアルキルカーボネート、ジメトキシエタン、ジオキソラン等の低粘度溶媒と混合して用いられている（「機能材料」、第１５巻、４月号、第４８頁、１９９５年）。しかし、低粘度溶媒は一般に沸点が低いため大量に添加すると電池内の蒸気圧が高くなり、溶媒の漏洩による安全性の低下が懸念される。また、低温下では、電解液の固化や導電率の低さが問題になることも多い。このような状況下で、リチウム二次電池用の電解液にはエチレンカーボネートとジエチルカーボネートの混合溶媒などが用いられている。しかし、これらの電解液を用いた電池でもサイクル特性等が不十分であるという問題がある。

【０００６】これらの問題点を改善するために、サルファイト化合物を溶媒として用いることが提案されている（例えば、特開平６－３０２３３６号公報、特開平７－１２２２９５号公報、特開平８－９６８５１号公報、特開平９－１２０８３７号公報など）。これらの公報では、サルファイト化合物を用いた電解液は、電気伝導率が高く、低粘度であるため、電池の低温特性等が良好であると報告されている。また二次電池におけるサイクル特性の向上という点からスルフォラン化合物を溶媒として用いることも提案されている（例えば、特開平３－１５２８７９号公報）。しかしながら、サルファイト化合物やスルフォラン化合物等のＳ－Ｏ結合を有する化合物を電解液に使用すると、電池が正常に作動しないことが見い出されている。特に、二次電池におけるサイクル特性の低下が著しく、実用化するためにはなお改善の余地が残されている。

【０００７】

【発明が解決しようとする課題】このような従来技術の状況に鑑みて、本発明は非水系電解液の溶媒として好ましい化合物を選択し、その機能が電池において十分に発揮される条件を見出すことを解決すべき課題とした。具体的には、低温特性および長期安定性に優れ、二次電池の場合にはサイクル特性に優れた高エネルギー密度の非水系電解液電池を提供することを解決すべき課題とした。

【０００８】

【課題を解決するための手段】このような課題を解決するために鋭意検討を行った結果、本発明者らはＳ－Ｏ結合を有する特定の化合物を非水系電解液の溶媒として選択し、かつ電解液が接触する正極集電体および外缶の材質を特定することによって、極めて優れた特性を有する非水系電解液電池を提供し得ることを見出した。

【０００９】すなわち本発明は、リチウムを活物質とする負極、正極、溶質および有機溶媒からなる非水系電解液、セパレータおよび外缶を備えた非水系電解液電池において、前記有機溶媒として、式（１）で表される化合物を少なくとも一種類含み、前記正極に用いた集電体の材質および前記外缶の正極側における電解液との接液部分の材質が弁金属またはその合金であることを特徴とする非水系電解液電池を提供する。

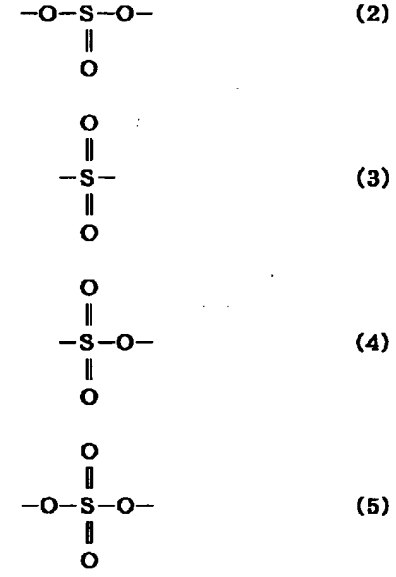
【００１０】

【化３】R_1-A-R_2　　（１）

（式中、R_1 およびR_2 は各々独立して、アリール基またはハロゲン原子で置換されていてもよいアルキル基、もしくはアルキル基またはハロゲン原子で置換されていてもよいアリール基を表すか、R_1 とR_2 は互いに結合して－Ａ－とともに不飽和結合を含んでいてもよい環状構造を形成し、Ａは式（２）～（５）のいずれかで表される構造を有する）

【００１１】

【化４】



(2)

(3)

(4)

(5)

【００１２】本発明で使用する弁金属またはその合金は、Ａｌ、Ｔｉ、Ｚｒ、Ｈｆ、Ｎｂ、Ｔａおよびこれらの金属を含む合金であるのが好ましく、ＡｌまたはＡｌ合金であるのがより好ましい。負極材料は、リチウムを吸蔵および放出可能な黒鉛などの炭素質材料、リチウムを吸蔵および放出可能な金属酸化物材料、リチウム金属およびリチウム合金から選択しうる。正極材料は、リチ

ウムを吸蔵および放出可能なリチウム遷移金属複合酸化物材料、遷移金属酸化物材料および炭素質材料から選択しうる。溶質としては、$LiClO_4$、$LiPF_6$、$LiBF_4$、$LiCF_3SO_3$、$LiN(CF_3SO_2)_2$、$LiN(CF_3CF_2SO_2)_2$、$LiN(CF_3SO_2)(C_4F_9SO_2)$および$LiC(CF_3SO_2)_3$を例示することができる。有機溶媒中の式（1）で表される化合物の含有量は0．05～100vol%の範囲内に設定するのが好ましい。また、電解液の溶質濃度は0．5～2．0モル／リットルに設定するのが好ましい。

【0013】

【発明の実施の形態】以下において、本発明の非水系電解液電池の実施形態について詳細に説明する。本発明の非水系電解液電池は、電解液の有機溶媒として、式（1）で表される化合物を少なくとも一種類含むことを必須要件とする。式（1）で表される化合物のR_1およびR_2は、各々独立してアリール基またはハロゲン原子で置換されていてもよいアルキル基、もしくはアルキル基またはハロゲン原子で置換されていてもよいアリール基を表すか、R_1とR_2は互いに結合して－A－とともに不飽和結合を含んでいてもよい環状構造を形成する。

【0014】R_1およびR_2がとりうるアルキル基は、好ましくは炭素数1～4のアルキル基であり、具体的にはメチル基、エチル基、プロピル基、イソプロピル基、ブチル基を挙げることができる。アルキル基の置換基となるアリール基としては、フェニル基、ナフチル基およびアントラニル基などを挙げることができるが、フェニル基が好ましい。また、アルキル基の置換基となるハロゲン原子としては、フッ素原子、塩素原子および臭素原子を好ましく用いることができる。これらの置換基はアルキル基に複数個置換していてもよく、またアリール基とハロゲン原子がともに置換していてもよい。

【0015】R_1とR_2が互いに結合して－A－とともに形成する環状構造は、4員環以上であり、二重結合または三重結合を含んでいてもよい。R_1とR_2が互いに結合して形成する結合基として、例えば$-CH_2-$、$-CH_2CH_2-$、$-CH_2CH_2CH_2-$、$-CH_2CH_2CH_2CH_2-$、$-CH_2CH_2CH_2CH_2CH_2-$、$-CH=CH-$、$-CH=CHCH_2-$、$-CH=CHCH_2CH_2-$、$-CH_2CH=CHCH_2-$、$-CH_2CH_2C\equiv CCH_2CH_2-$を例示することができる。これらの1以上の水素原子は、アルキル基、ハロゲン原子、アリール基などによって置換されていてもよい。

【0016】Aが式（2）で表される構造を有する化合物の具体例として、ジメチルサルファイト、ジエチルサルファイト、エチルメチルサルファイト、メチルプロピルサルファイト、エチルプロピルサルファイト、ジフェニルサルファイト、メチルフェニルサルファイト、エチルサルファイト、ジベンジルサルファイト、ベンジルメチルサルファイト、ベンジルエチルサルファイト等の鎖状サルファイト；エチレンサルファイト、プロピレンサルファイト、ブチレンサルファイト、ビニレンサルファイト、フェニルエチレンサルファイト、1－メチル－2－フェニルエチレンサルファイト、1－エチル－2－フェニルエチレンサルファイト等の環状サルファイト；およびこれらの鎖状サルファイトや環状サルファイトのハロゲン化物を挙げることができる。

【0017】Aが式（3）で表される構造を有する化合物の具体例として、ジメチルスルホン、ジエチルスルホン、エチルメチルスルホン、メチルプロピルスルホン、エチルプロピルスルホン、ジフェニルスルホン、メチルフェニルスルホン、エチルフェニルスルホン、ジベンジルスルホン、ベンジルメチルスルホン、ベンジルエチルスルホン等の鎖状スルホン；スルフォラン、2－メチルスルフォラン、3－メチルスルフォラン、2－エチルスルフォラン、3－エチルスルフォラン、2，4－ジメチルスルフォラン、スルフォレン、3－メチルスルフォレン、2－フェニルスルフォラン、3－フェニルスルフォラン等の環状スルホン；および上記鎖状スルホンや環状スルホンのハロゲン化物等を挙げることができる。

【0018】Aが式（4）で表される構造を有する化合物の具体例として、メタンスルホン酸メチル、メタンスルホン酸エチル、メタンスルホン酸プロピル、エタンスルホン酸メチル、エタンスルホン酸エチル、エタンスルホン酸プロピル、ベンゼンスルホン酸メチル、ベンゼンスルホン酸エチル、ベンゼンスルホン酸プロピル、メタンスルホン酸フェニル、エタンスルホン酸フェニル、プロパンスルホン酸フェニル、ベンジルスルホン酸メチル、ベンジルスルホン酸エチル、ベンジルスルホン酸プロピル、メタンスルホン酸ベンジル、エタンスルホン酸ベンジル、プロパンスルホン酸ベンジル等の鎖状スルホン酸エステル：1，3－プロパンスルトン、1，4－ブタンスルトン、3－フェニル－1，3－プロパンスルトン、4－フェニル－1，4－ブタンスルトン等の環状スルホン酸エステル；および上記鎖状スルホン酸エステルや環状スルホン酸エステルのハロゲン化物を挙げることができる。

【0019】Aが式（5）で表される構造を有する化合物の具体例として、硫酸ジメチル、硫酸ジエチル、硫酸エチルメチル、硫酸メチルプロピル、硫酸エチルプロピル、硫酸メチルフェニル、硫酸エチルフェニル、硫酸フェニルプロピル、硫酸ベンジルメチル、硫酸ベンジルエチル等の鎖状硫酸エステル；エチレングリコール硫酸エステル、1，2－プロパンジオール硫酸エステル、1，3－プロパンジオール硫酸エステル、1，2－ブタンジオール硫酸エステル、1，3－ブタンジオール硫酸エステル、2，3－ブタンジオール硫酸エステル、フェニルエチレングリコール硫酸エステル、メチルフェニルエチ

レングリコール硫酸エステル、エチルフェニルエチレングリコール硫酸エステル等の環状硫酸エステル；および上記鎖状硫酸エステルや環状硫酸エステルのハロゲン化物を挙げることができる。

【0020】これらの式（1）で表される化合物は、一種類だけを選択して使用してもよいし、二種類以上を組み合わせて用いてもよい。二種類以上の化合物を組み合わせて使用する場合は、Aの構造が異なる化合物を混合して使用することもできる。非水系電解液中の有機溶媒に含まれる式（1）の化合物量は、0．05～100vol%の範囲内であるのが好ましい。式（1）で表される化合物の中には室温で固体のものもあるが、その場合は使用する有機溶媒への飽和溶解量以下、好ましくは飽和溶解量の60重量%以下、より好ましくは飽和溶解量の30重量%以下の範囲で使用する。式（1）の化合物の含有量が0．05vol%以下になると、本発明の効果が明確に現れない傾向がある。なお、本明細書において「～」を用いて記載される範囲はその前後に記載される数値を含むものである。

【0021】非水系電解液中の有機溶媒には式（1）で表される化合物以外の溶媒も使用することができる。例えば、エチレンカーボネート、プロピレンカーボネート、ブチレンカーボネート等の環状カーボネート類；ジメチルカーボネート、ジエチルカーボネート、エチルメチルカーボネート等の鎖状カーボネート類；γ－ブチロラクトン、γ－バレロラクトン等の環状エステル類；酢酸メチル、プロピオン酸メチル等の鎖状エステル類；テトラヒドロフラン、2－メチルテトラヒドロフラン、テトラヒドロピラン等の環状エーテル類；ジメトキシエタン、ジメトキシメタン等の鎖状エーテル類；リン酸エチレンメチル、リン酸エチルエチレン等の環状リン酸エステル；リン酸トリメチル、リン酸トリエチル等の鎖状リン酸エステル；これらの化合物のハロゲン化物；および式（1）で表される化合物以外の含硫黄有機溶媒などを使用することができる。これらの有機溶媒は、一種類だけを選択して使用してもよいし、二種類以上を組み合わせて用いてもよい。

【0022】非水系電解液に用いる溶質としては、$LiClO_4$、$LiPF_6$、$LiBF_4$等の無機リチウム塩；$LiCF_3SO_3$、$LiN(CF_3SO_2)_2$、$LiN(CF_3CF_2SO_2)_2$、$LiN(CF_3SO_2)(C_4F_9SO_2)$および$LiC(CF_3SO_2)_3$等の含フッ素有機リチウム塩等を挙げることができる。これらの溶質は、一種類だけを選択して使用してもよいし、二種類以上を組み合わせて用いてもよい。溶質であるリチウム塩の電解液中におけるモル濃度は、0．5～2．0モル／リットルの範囲内であることが望ましい。モル濃度が0．5モル／リットル未満もしくは2．0モル／リットルを越えると、電解液の電気伝導率が低く、電池の性能が低下する傾向がある。

【0023】本発明の非水系電解液電池を構成する負極は、リチウムを活物質とする負極である。本明細書において、「リチウムを活物質とする」とは、リチウム金属、リチウム化合物またはリチウムイオンが電極反応に関与することを意味する。負極を構成する材料としては、例えば様々な条件下で有機物を熱分解した分解生成物、難黒鉛性炭素、人造黒鉛、天然黒鉛等のリチウムを吸蔵・放出可能な炭素質材料；酸化錫、酸化珪素等のリチウムを吸蔵・放出可能な金属酸化物材料；リチウム金属；および種々のリチウム合金を使用することができる。これらの負極材料は、一種類だけを選択して使用してもよいし、二種類以上を組み合わせて用いてもよい。

【0024】これらの負極材料を用いて、負極を製造する方法は特に制限されない。例えば、負極材料に必要に応じて結着材、導電材、溶媒等を加えてスラリー状にし、集電体の基板に塗布して乾燥することによって電極を製造することができる。また、該電極材料をそのままロール成形してシート状に成形したり、圧縮成形等によってペレット状に成形することもできる。

【0025】電極の製造に使用する結着材は、電極製造時に使用する溶媒や電解液に対して安定な材料であれば特にその種類は制限されない。具体的には、ポリエチレン、ポリプロピレン、ポリエチレンテレフタレート、芳香族ポリアミド、セルロース等の樹脂系高分子；スチレン・ブタジエンゴム、イソプレンゴム、ブタジエンゴム、エチレン・プロピレンゴム等のゴム状高分子；スチレン・ブタジエン・スチレンブロック共重合体およびその水素添加物、スチレン・エチレン・ブタジエン・スチレンブロック共重合体およびその水素添加物；スチレン・イソプレン・スチレンブロック共重合体およびその水素添加物等の熱可塑性エラストマー状高分子；シンジオタクチック1，2－ポリブタジエン、エチレン・酢酸ビニル共重合体、プロピレン・α－オレフィン（炭素数2～12）共重合体等の軟質樹脂状高分子；ポリフッ化ビニリデン、ポリテトラフルオロエチレン、ポリテトラフルオロエチレン・エチレン共重合体等のフッ素系高分子を例示することができる。

【0026】また、結着材として、特にリチウムイオンなどのアルカリ金属イオン伝導性を有する高分子組成物を使用することもできる。そのようなイオン伝導性を有する高分子としては、ポリエチレンオキシド、ポリプロピレンオキシド等のポリエーテル系高分子化合物、ポリエーテルの架橋高分子化合物、ポリエピクロルヒドリン、ポリフォスファゼン、ポリシロキサン、ポリビニルピロリドン、ポリビニリデンカーボネート、ポリアクリロニトリル等の高分子化合物に、リチウム塩またはリチウムを主体とするアルカリ金属塩を複合させた系、あるいはこれにプロピレンカーボネート、エチレンカーボネート、γ－ブチロラクトン等の高い誘電率を有する有機化合物を配合した系を用いることができる。これらの材

料は組み合わせて使用してもよい。

【0027】負極材料と上記の結着材との混合形式としては、各種の形態をとることができる。即ち、両者の粒子が混合した形態、繊維状の結着材が負極材料の粒子に絡み合う形で混合した形態、または結着材の層が粒子表面に付着した形態などが挙げられる。負極材料の粉体に対する上記結着材の混合割合は、負極材料に対して好ましくは0．1～30重量%、より好ましくは0．5～10重量%である。30重量%を超える量の結着材を添加すると電極の内部抵抗が大きくなる傾向にあり、逆に0．1重量%未満の量の結着材では集電体と負極材料の結着性が劣る傾向にある。

【0028】また、負極材料と結着材との混合に際して、導電材を併せて混合してもよい。使用する導電材の種類は特に制限されないため、金属であっても非金属であってもよい。金属の導電材としては、CuやNiなどの金属元素から構成される材料を挙げることができる。また、非金属の導電材としては、グラファイト、カーボンブラック、アセチレンブラック、ケッチェンブラックなどの炭素材料を挙げることができる。導電材の平均粒径は1μm以下であるのが好ましい。

【0029】導電材の混合割合は、負極材料に対して好ましくは0．1～30重量%、より好ましくは0．5～15重量%にする。導電材の混合割合を30重量%以下にすることによって単位体積あたりの電極の充放電容量を比較的高くすることができる。また、導電材の混合割合を0．1重量%以上にすることによって導電材同士の導電パスを電極内に十分に形成することができる。

【0030】少なくとも負極材料と結着材を含む上記混合物は、電極の使用目的に応じて集電体上に適用する。適用する集電体の形状は特に制限されず、負極の使用態様などに応じて適宜決定することができる。例えば、円柱状、板状、コイル状の集電体を使用することができる。集電体の材質は、銅、ニッケル、ステンレス等の金属であるのが好ましく、これらの中では薄膜に加工しやすく安価であることから銅箔を使用するがより好ましい。

【0031】集電体への適用は、当業者に公知の手段によって行うことができる。混合物がスラリー状である場合は、例えばダイコーターやドクターブレードなどを用いて集電体上に塗布することができる。また、混合物がペースト状である場合は、ローラーコーティングなどによって集電体上に塗布することができる。溶媒を使用している場合は乾燥して溶媒を除去することによって、電極を作製することができる。

【0032】本発明の非水系電解液電池を構成する正極には、例えば、リチウムコバルト酸化物、リチウムニッケル酸化物、リチウムマンガン酸化物等のリチウム遷移金属複合酸化物材料；二酸化マンガン等の遷移金属酸化物材料；フッ化黒鉛等の炭素質材料などのリチウムを吸蔵・放出可能な材料を使用することができる。具体的には、$LiFeO_2$、$LiCoO_2$、$LiNiO_2$、$LiMn_2O_4$およびこれらの非定比化合物、MnO_2、TiS_2、FeS_2、Nb_3S_4、Mo_3S_4、CoS_2、V_2O_5、P_2O_5、CrO_3、V_3O_3、TeO_2、GeO_2等を用いることができる。正極の製造方法は特に制限されず、上記の負極の製造方法と同様の方法により製造することができる。

【0033】本発明で用いる正極集電体には、弁金属またはその合金を用いる。本明細書において「弁金属」とは、公知の用語と同じ意味であって、すなわち電解液中での陽極酸化によって表面に不動態皮膜を形成する金属を意味する。弁金属としては、IIIa、IVa、Va族（3B、4B、5B族）に属する金属およびこれらの合金を例示することができる。具体的には、Al、Ti、Zr、Hf、Nb、Taおよびこれらの金属を含む合金などを例示することができ、Al、Ti、Taおよびこれらの金属を含む合金を好ましく使用することができる。特にAlおよびその合金は軽量であるためエネルギー密度が高くて望ましい。

【0034】弁金属は表面が酸化被膜で覆われているため電解液との接液部分において、式（1）で表される化合物が酸化分解するのを有効に防止することができる。これに対して、ステンレスなどの弁金属以外の金属材料を用いた場合には、S－O結合を有する化合物の酸化分解反応を防止することができない。したがって、本発明によれば、一次電池では長期保存性、二次電池ではサイクル特性を有効に高めることができる。

【0035】正極集電体と同様に、外缶の正極側における電解液との接液部分についても弁金属またはその合金を使用する。外缶全体を弁金属またはその合金で構成してもよいし、接液部分だけを弁金属またはその合金で保護してもよい。前者の例として、AlやAl合金を外缶とする例を挙げることができる。また、後者の例として、電池の外缶として好適に用いられるステンレスの接液部分をAlやAl合金で保護した例を挙げることができる。弁金属で保護する方法としては、メッキや箔で保護する方法を例示することができる。なお、本明細書で用いている「外缶」という用語には、電池内部に収納されているリード線や電池内部の内圧が上昇したときに作動する安全弁等の部分も含まれる。

【0036】本発明の電池に使用するセパレーターの材質や形状は特に制限されない。セパレーターは正極と負極が物理的に接触しないように分離するものであり、イオン透過性が高く、電気抵抗が低いものであるのが好ましい。セパレータは電解液に対して安定で保液性が優れた材料の中から選択するのが好ましい。具体的には、ポリエチレン、ポリプロピレン等のポリオレフィンを原料とする多孔性シートまたは不織布を用いて、上記電解液を含浸させることができる。

【0037】上記の非水系電解液、負極、正極、外缶およびセパレータを用いて非水系電解液電池を製造する方法は、特に限定されず通常採用されている方法の中から適宜選択することができる。本発明の非水系電解液電池には、非水系電解液、負極、正極、外缶およびセパレータの他に必要に応じて、ガスケット、封口板、セルケースなどを用いることもできる。その製法は、例えば外缶上に負極を乗せ、その上に電解液とセパレータを設け、さらに負極と対向するように正極を乗せて、ガスケット、封口板と共にかしめて電池にすることができる。電池の形状は特に制限されず、シート電極およびセパレータをスパイラル状にしたシリンダータイプ、ペレット電極およびセパレータを組み合わせたインサイドアウト構造のシリンダータイプ、ペレット電極およびセパレータを積層したコインタイプ等にすることができる。

【0038】

【実施例】以下に実施例を挙げて本発明をさらに具体的に説明する。以下に示す材料、使用量、割合、操作等は、本発明の精神から逸脱しない限り適宜変更することができる。したがって、本発明の範囲は以下に示す具体例に制限されるものではない。

【0039】（実施例1～13）正極材料である$LiCoO_2$（90重量部）にカーボンブラック（6重量部）およびポリフッ化ビニリデン（4重量部）を加えて混合し、N－メチル－2－ピロリドンで分散してスラリーにした。このスラリーを、正極集電体である厚さ20μmのA1箔上に均一に塗布し、乾燥後、所定の形状に打ち抜いて正極とした。

【0040】負極材料である人造黒鉛粉末（ティムカル社製、商品名：KS－44）（90重量部）にポリフッ化ビニリデン（10重量部）を混合し、N－メチル－2－ピロリドンで分散してスラリー状にした。このスラリーを負極集電体である厚さ18μmの銅箔上に均一に塗布し、乾燥後、所定の形状に打ち抜いて負極とした。

【0041】電解液については、エチレンサルファイト（ES）、ジメチルサルファイト（DMS）、スルフォラン（SLA）、スルフォレン（SLE）、1，3－プロパンスルトン（PSL）、環状カーボネートであるエチレンカーボネート（EC）、鎖状カーボネートであるジエチルカーボネート（DEC）、環状エステルであるγ－ブチロラクトン（GBL）、鎖状エステルであるプロピオン酸メチル（MP）、環状エーテルであるテトラヒドロフラン（THF）、鎖状エーテルであるジメトキシエタン（DME）を表1に示す組成で混合した溶媒に、溶質として十分に乾燥した六フッ化リン酸リチウム（$LiPF_6$）を1モル／リットルになるように乾燥アルゴン雰囲気下で溶解することによって調製した。

【0042】これらの正極、負極、電解液を用いて、図1に示すコイン型非水系電解液電池を乾燥アルゴン雰囲気下で作製した。すなわち、正極1と負極2とを、それぞれステンレス製の正極缶（外缶）3と封口板4に収容し、電解液を含浸させたポリエチレンの微孔性フィルムからなるセパレーター5を介して積層した。このとき正極側の接液部分の材質を弁金属とするために、前もって正極缶3の内側をA1箔6で覆ったものを使用した。続いて、正極缶3と封口板4とをガスケット7を介してかしめ密封して、コイン型電池を作製した。

【0043】（比較例1～9）内側をA1箔6で覆っていない正極缶を用いた点を除いて、上記実施例1～5および10～13と同様にしてコイン型電池を作製した。実施例1～13および比較例1～9の各電池を25℃において、0．5mAの定電流で充電終止電圧4．2V、放電終止電圧2．5Vで充放電試験を行った。それぞれの電池における1サイクル目の負極重量あたりの充電容量と放電容量を表1に示す。また、実施例2および比較例2の充放電サイクルにともなう負極重量あたりの放電容量の変化を図2に示し、実施例13および比較例9の充放電サイクルにともなう負極重量あたりの放電容量の変化を図3に示す。

【0044】

【表1】

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	溶媒組成（体積%）	初期充電容量（mAh/g）	初期放電　量（mAh/g）
実施例1	ES＝100	243	153
比較例1	ES＝100	1143	2
実施例2	ES：EC＝50：50	387	220
比較例2	ES：EC＝50：50	410	20
実施例3	ES：DEC＝50：50	230	90
比較例3	ES：DEC＝50：50	240	47
実施例4	ES：DEC＝20：80	310	192
比較例4	ES：DEC＝20：80	350	95
実施例5	ES：DEC＝1：99	250	176
比較例5	ES：DEC＝1：99	95	40
実施例6	ES：GBL＝50：50	262	128
実施例7	ES：MP＝50：50	273	182
実施例8	ES：THF＝50：50	297	228
実施例9	ES：DME＝50：50	273	203
実施例10	DMS：EC＝50：50	394	122
比較例6	DMS：EC＝50：50	598	87
実施例11	SLA：DEC＝50：50	363	219
比較例7	SLA：DEC＝50：50	358	185
実施例12	SLE：EC：DEC＝10：45：45	320	49
比較例8	SLE：EC：DEC＝10：45：45	206	0
実施例13	PSL：EC：DEC＝10：45：45	289	244
比較例9	PSL：EC：DEC＝10：45：45	281	231

【００４５】表1、図2および図3から明らかなように、正極側の接液部分の材質がステンレス等の場合には、電解液に含まれている式（１）で表される化合物の酸化分解反応が進行するために十分な放電容量を得ることができない。それに対して、正極側の接液部分の材質がＡ１である場合には、該酸化分解が抑制され、放電容量およびサイクル特性が著しく改善されている。

【００４６】

【発明の効果】電解液の有機溶媒として式（１）で表される化合物を選択し、正極集電体および正極側外缶の電解液との接液部分に弁金属またはその合金を使用することによって、低温特性および長期安定性に優れ、二次電池の場合にはサイクル特性に優れた非水系電解液電池を提供することができる。この非水系電解液電池は、電気製品やエネルギー貯蔵設備などに幅広く応用することが可能である。

【図面の簡単な説明】

＊【図１】　コイン型電池の構造例を示す断面図である。

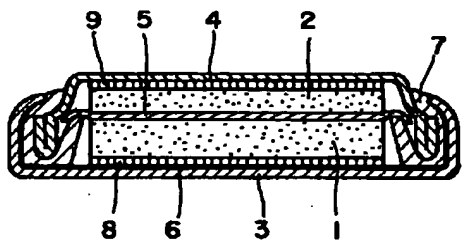
【図２】　本発明の実施例２および比較例２の非水系電解液電池の充放電サイクルと放電容量との関係を示す図である。

【図３】　本発明の実施例１３および比較例９の非水系電解液電池の充放電サイクルと放電容量との関係を示す図である。

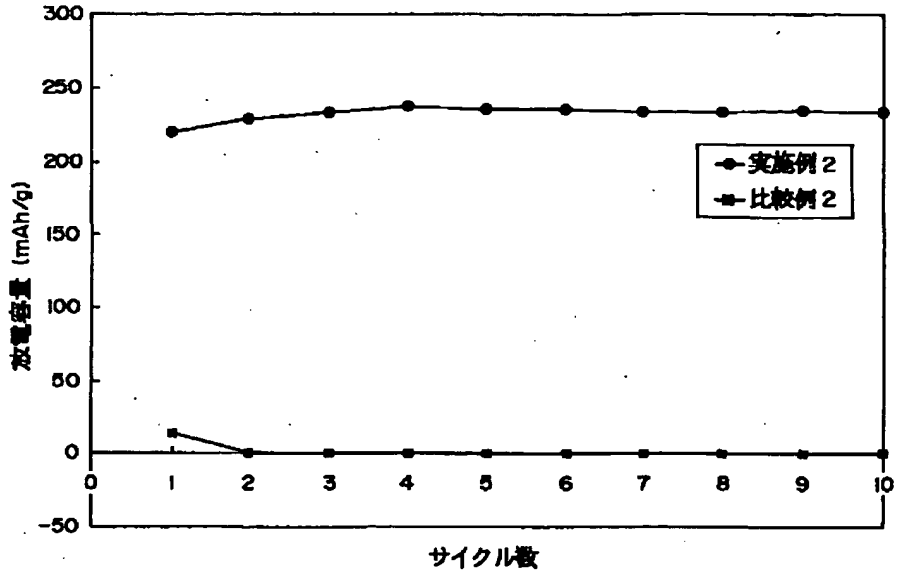
【符合の説明】

１：　正極
２：　負極
３：　正極缶（外缶）
４：　封口板
５：　セパレータ
６：　Ａ１箔
７：　ガスケット
８：　正極集電体
９：　負極集電体

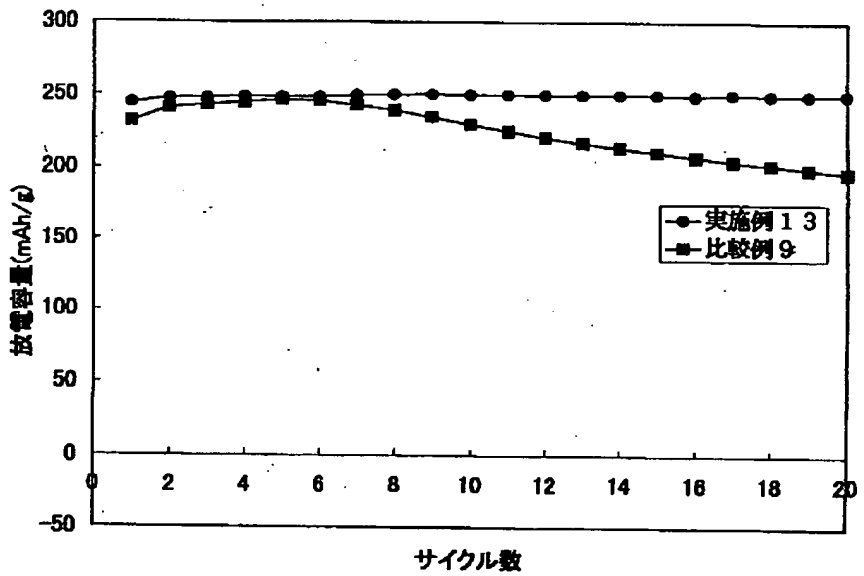
【図１】



【図2】



【図3】



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